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THE CLIMATE OF ANCIENT PALESTINE, PART III.* (CONCLUSION.)

BY

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(4) WATERLESS RUINS.—The desert borders of Palestine contain scores of places where the ruins of large cities are tenanted today by a mere handful of squalid Arabs. The country around the ancient cities usually abounds in small ruins, which once were prosperous villages, although now they occupy regions which have almost no water supply. In addition to the remnants of cities and villages there are ancient terraces and other indications that the whole region was once thickly settled by an agricultural people. Petra, Philadelphia, Gerasa, Bosra, and Palmyra are among the best-known examples of cities whose glory has departed and whose sites are left desolate. In every one of these cities and in scores of other places the present water supply seems to be inadequate for the support of a population such as is indicated by the size and magnificence of the ruins. Nevertheless, travellers of all sorts, both scientific and unscientific, are prone to say that if the present inhabitants would bestir themselves, if they would give up their lazy habits and emulate their predecessors, and if they could be freed from the twofold curse of misgovernment on the one hand and Beduin raids on the other, the whole country might be restored to its ancient state of prosperity. They assume that natural conditions have not changed beyond remedy. Unfortunately, in most cases we have no accurate statistics upon which to base an estimate of the truth of this assumption, for in modern times no part of the country has ever enjoyed the happy

* Part II. in BULLETIN for October, p. 577.

MAP OF SYRIA AND SURROUNDING COUNTRIES.

conditions demanded by the traveller. The best that can be done is to gather together chance bits of information and examine them as closely as possible, trusting that ere many years the whole question may be studied in detail.

It may fairly be assumed that all the ruins of Syria owe their permanent abandonment to the same cause which has occasioned the general decline of the country. Earthquakes, floods, pestilence and similar sporadic phenomena may account for the temporary desolation of certain places, but they can scarcely have caused the permanent and complete depopulation which we see throughout the borders of Syria and Palestine. Therefore, in what follows it will be assumed that the decline of the once prosperous region of eastern Syria is due to one of the two causes which have been mentioned so often, namely, human folly, which includes war, misgovernment, laziness, and ignorance, and changes in natural conditions of rainfall, temperature and the like. A single city will serve as a type of all.

PALMYRA.*—The largest, the most famous, and the most fully described of the ruined cities of eastern Syria is Palmyra. We have no certain knowledge of it until about 50 B. C., when Antony, at the instigation of Cleopatra, sent an expedition to plunder it. The inhabitants, largely merchants, took their most valuable possessions and fled across the Euphrates where they were able to repulse the Romans. For three centuries thereafter Palmyra grew in wealth until the days of Zenobia. We cannot recount here the familiar story of the gracious Arab queen, whose wonderful beauty was only equalled by her rare learning, chastity, wisdom and courage. Suffice it to say, that in her day Palmyra ruled the East from Egypt to the Bosporus; but the glory of the desert Queen and her desert city was short-lived. In 271 A. D. Palmyra was conquered by the Emperor Aurelian, who restored the sway of Rome. He did not destroy the city, but, nevertheless, it steadily declined. Its trade rapidly fell off, and the huge caravans which had formerly brought to it the wealth of India, Persia and Arabia no longer frequented its marts, but went far to the north by way of Aleppo on the border of the Syrian desert. The fall of Palmyra was like that of Petra and Bosra; and the causes were probably the same in all three cases. In the early days when Petra and Bosra were prosperous and when caravans crossed all parts of the desert, Palmyra was rich, but was only one city among many. Then when the trade of the southern cities decayed, all the commerce of the East was concentrated at Palmyra,

*See Map accompanying Part I. in the BULLETIN for September, p. 513.

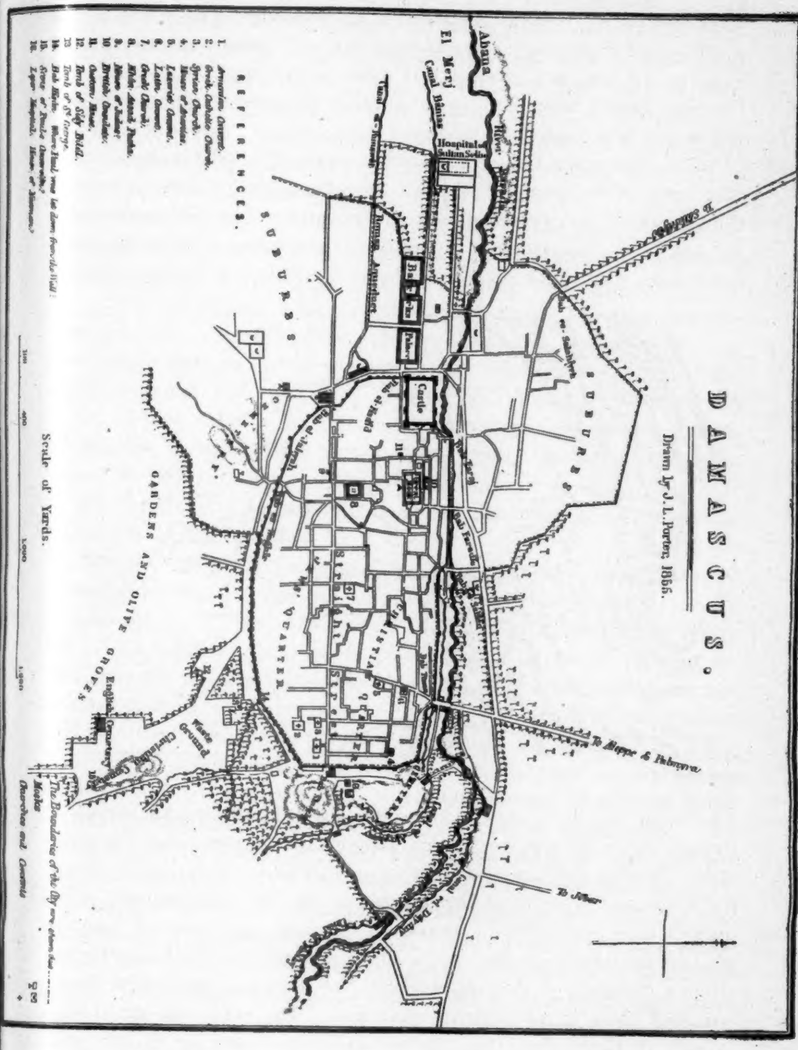
and its wealth and luxury increased amazingly. Finally, like its predecessors, Palmyra succumbed to the influence which was driving trade and civilization northward. In the fourth and fifth centuries it recovered somewhat from the decline which had taken place at the end of the third century, and became a Roman post and an archbishopric under the Metropolitan of Damascus. In the sixth century Justinian repaired the city, which had been for some time almost deserted, restored the walls, and built an aqueduct to supply water to the garrison which he stationed there. This is the last that is known of Palmyra in Roman history. When the Mohammedans took possession of the country it was of no importance whatever, so far as can be learned. It recovered somewhat, however, during the Middle Ages, for among its ruins are those of a large mediæval castle, and Benjamin of Tudela says that when he visited it, about 1172 A.D., its population included two thousand Jewish merchants. With such a number of merchants, or even with half as many, the total population must have been at least five or ten thousand. In the days of Abulfeda, 1321 A. D., it had probably already declined, for he simply mentions its palm and fig trees and its ruined columns and temples. To-day Palmyra is a squalid village of wattled mud huts, shaped like bee-hives. It varies in size apparently. Addison (1838: II: 333) says that in 1835 it had only 12 or 15 families; Cernik (1875: 10) attributes to it a population of 800 souls; while most authors say that it has only 40 or 50 families; that is, two or three hundred people. Their wretched dwellings are clustered within the ruins of the splendid Temple of the Sun.

Among modern cities the one which most closely resembles ancient Palmyra is Damascus. On the whole, the modern capital of Syria appears to be smaller and less wealthy than its predecessor. The character of the two may be judged from a comparison of Pliny's description of Palmyra with the description of Damascus in "Mill's International Geography," a book which serves much the same place to the modern Englishman that Pliny's work did to the citizens of the Roman Empire. The description of Palmyra runs thus: "Palmyra is a city famous for the beauty of its site, the riches of its soil, and the delicious quality and abundance of its water. Its fields are surrounded by sands on every side, and are thus separated, as it were, by nature from the rest of the world. Though placed between the two great empires of Rome and Parthia, it still maintains its independence; never failing, at the very first moment that a rupture is threatened between them, to attract the careful attention of both."

The modern description of Damascus runs thus: "Damascus, the largest town in Syria, (is) built amidst extensive gardens, on the edge of the desert beneath Anti-Lebanon. Lines of railway connect Beirut with Damascus and a steam tramway runs from Damascus to the Hauran. Other inland transport is by mule or camel."

The two descriptions give the same general impression. The size of the two places may be judged from the following statements of Porter (1855: 137 and 239): "That portion of the ancient city [of Damascus] within the circuit of the ancient walls [built by the Romans at about the same time when the walls of Palmyra were built] is about three miles in circumference. It is densely populated throughout, with the exception of a few gardens on the south side. On the northern side of the city proper there is an extensive suburb; but by far the largest suburb lies on the south and west of the city, stretching out into the plain for about two miles. [The city's] length, from north to south, is about three miles, and its greatest breadth, a mile and a half." The circuit of the city is about nine miles, according to Porter's map and description. In regard to Palmyra, he says that the walls "are only about three miles in circumference [the same as those of Damascus], but there is sufficient evidence to show that the ancient city extended far beyond them, and probably occupied a space nearly ten miles in circumference." Evidently ancient Palmyra and modern Damascus were of about the same size, so far as area is concerned. This is made clear by the two accompanying plans (Figs. 5 and 6), which are reproduced from Porter's book, and have been reduced to approximately the same scale. The plan of Palmyra is on a slightly smaller scale than that of Damascus. It looks much smaller because the parts of the old city outside the wall are not included. If the walls of the two cities are compared, or if the grand colonnade of Palmyra be compared with the similar avenue called Straight Street in Damascus, a very fair idea will be obtained as to the relative size of the two "Queen-cities of the Desert." The greatness of the fall of Palmyra may be judged from the fact that the modern village does not fill much more than half of the Temple of the Sun which is represented by the square at the east end of the plan. Modern Damascus is estimated to have a population of about 180,000. In its days of greatness Palmyra must have had approximately the same number.

In addition to its great urban population, Palmyra apparently had a suburban population quite equal to that of Damascus. Pliny and other ancient authors speak of a number of towns which appear to have been located somewhere near it, but which are now entirely


DAMASCUS.
Drawn by J. L. Porter, 1855.
SUBURBS
SUBURBS
GARDENS AND OLIVE GROVES
REFERENCES.
Scale of Yards.
Castle
Abana
River
El Merj
Hospital of Sultan Selim
To Aleppo & Palmyra
CHRISTIAN QUARTER
Straight Street
English Cemetery
Christian Cemetery

unknown. Sachau (1883: 40, 41) says that the actual city of Palmyra is much larger than is shown on any maps hitherto issued. He adds that he was told of the ruins of a city lying eight hours to the southeast of Palmyra in the waterless desert. Moritz inserts several ruins on his map in a group a few miles to the south of the city, and Ptolemy locates here the city of Aucria. It appears that the desert was at one time quite well inhabited.

In the old days Palmyra was renowned for the abundance and excellence of its springs. To-day, travellers, almost without exception, speak of the wretchedness of the water. The only permanent springs smell so strongly of sulphur that many foreigners carry water with them. The water of Palmyra is lukewarm at all seasons.

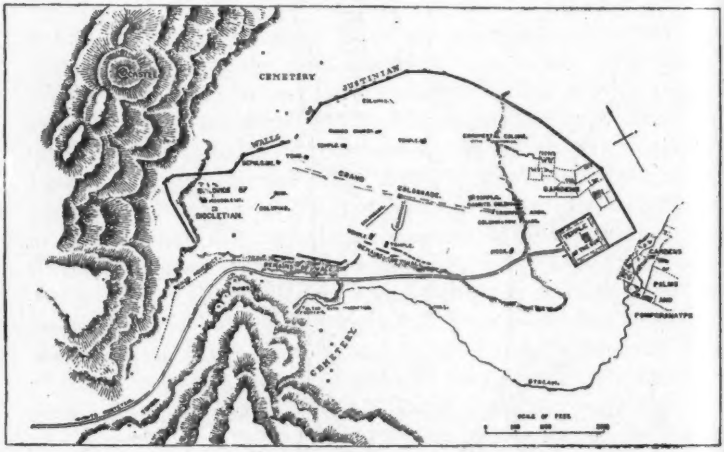


FIG. 6.—PLAN OF THE RUINS OF PALMYRA.

The main supply comes from a fair-sized fountain and serves to irrigate the palm gardens which support the present scanty population. Besides this, there is an old aqueduct which still supplies water for a few palms north of the Temple of the Sun, and another aqueduct of large size, which contains a deep pool, but does not send out any stream which can be used. The aqueduct appears to have come from a distance of five miles from Abu Fawaris northwest of the city, but there is no evidence that water was ever brought from a greater distance than this, as has sometimes been supposed.. All the way from Abu Fawaris to the city there must have been villages and gardens, according to Moritz (1889: 8), and the whole distance is dotted with circular mounds marking the mouth of wells lead-

ing down into the aqueduct. The water supply of to-day is by no means enough for the present population, although there is only one person now for from 200 to 1,000 in the past. Various travellers have found the Arabs digging vigorously in the hope of increasing the supply. In the fall of 1872, when the springs were at their lowest, Cernik (1875: 11) found no water except "a very unattractive little brooklet" [quellbächlein]; and other travellers speak of the water with similar disrespect. Yet Ptolemy says that there was in his day a "river" at Palmyra.

As to the cause of the manifest decrease in the amount of water available, there can be little doubt that man's carelessness and folly have something to do with it, but these things can scarcely explain the enormous change which is all too apparent. Neither can the change be due to earthquakes. Duhn (1894: 113) says that more or less severe movements of the earth took place in this part of the world, although not necessarily at Palmyra, in 434, 1089, and 1759 A. D. These dates seem to have no connection with the most critical periods of the history of the city. The occasional writers who appeal to earthquakes in explanation of the fall of Palmyra appear to do so merely as a makeshift to get rid of the necessity of postulating changes of climate.

The real cause of Palmyra's present sad condition seems to be lack of rainfall. In 1872 the condition of the water supply was very bad, as we have seen. In 1889 it was much better. Hill (1890) says, "All modern notices of the place which I have read refer to the fact that no fresh water is to be found there, and some express wonder at the ancient prosperity of the Palmyrenes in the absence of this requisite. The guide-books recommend the traveller to bring a supply of drinking water with him, as the stream of sulphurous water, which, till last summer, was alone known in modern times as the source of supply there is very disagreeable to the taste. We were, therefore, much surprised [in April, 1889] to find that the stream near which our tents were pitched was fresh and pure. It appears that it was only discovered in the summer of 1888, and that we were the first Europeans to see it. It runs only a few feet under the surface of the ground in an old flagged channel."—"The finding of this stream has stirred up the inhabitants to search for more fresh water, and pits were sinking in several places during our visit."

The explanation of the finding of the new supply of fresh water seems to be very simple. During the rainy season preceding the spring of 1872 the precipitation at Jerusalem amounted to 18.5 inches, during the three preceding rainy seasons it amounted to an

average of 16.7 inches, and during the ten preceding seasons, to an average of 20.5 inches. During the one, three, and ten seasons preceding the spring of 1889 the precipitation amounted to 35.7, 29.2, and 27.7 inches, respectively. Throughout Syria and all western and central Asia 1872 and the preceding years were times of slight rainfall and, consequently, of famine; while 1888 was a year of abundant rainfall, and, hence, of abundant crops. When the ground became filled with water by a succession of comparatively wet years previous to 1889, the water supply at Palmyra became relatively abundant and palatable. It is reasonable to suppose that when Palmyra was one of the world's great cities there was rain enough, even in the dryest years, to keep the water supply abundant and fresh. The ability of an arid region to support population depends upon the rainfall of the dry years. If there are more people than can be supported by the diminished crops, famine overtakes the land, except where there are modern means of transportation; and part of the inhabitants of necessity die. Therefore, it seems highly probable that at the beginning of the Christian era the rainfall was always sufficient to furnish Palmyra with an amount of water much greater and of better quality than that which was found in the favourable year 1889. When the water supply decreased Palmyra must have fallen, no matter what other circumstances may have intervened. The history of the city suggests that the water supply may have become very slight five or six centuries after Christ, and then may have increased in the Middle Ages in the days of the Jewish merchants, only to diminish once more in modern times.

Conclusion. The four lines of evidence which have been discussed above may now be matched with the four climatic hypotheses set forth in the earlier pages of this article. The hypotheses, it will be remembered, are: (1) uniformity, (2) change due to deforestation, (3) progressive change, and (4) pulsatory change. The lines of evidence are: (1) the population of ancient Palestine; (2) deforestation; (3) ancient routes of invasion, migration, and trade; and (4) waterless ruins. The density of population in past times is a highly important matter, but it is not so conclusive as might be supposed, so far as changes of climate are concerned. The great number of people in Palestine in early times may possibly be compatible with the hypothesis of a uniform climate; and it is eminently compatible with those of progressive and pulsatory changes: it is certainly incompatible with the hypothesis that changes of climate have been caused by deforestation, for there cannot have been many forests where there were so many people dependent upon agriculture. The

former distribution of forests suggests a change of climate, but does not prove it. The subject is chiefly important as showing that the common view as to the influence of deforestation upon the climate of Palestine is untenable. There seems to be no evidence whatever that the cutting away of forests has had any appreciable effect upon the rainfall, although it may have done harm in other ways. We may, therefore, definitely abandon the hypothesis of changes of climate due to deforestation.

In the abundant evidence as to ancient routes of invasion, migration and trade there are many facts which are inexplicable if the climatic conditions of the past were like those of the present. It is incredible that the ancient writers who describe the wanderings of the Israelites, the wars of Assyria and Egypt, and the commerce of Rome should all have falsified their accounts of desert regions. Almost without exception they speak as if the Syrian Desert, Sinai, and other arid regions were then less dry than they are now. They also describe specifically routes which were then much travelled but are now utterly impracticable. There seems to be no possibility that any human efforts within the means at the command of the ancient empires of the East could now make the centre of the Syrian Desert passable for large and numerous caravans. In view of such stubborn facts, there appears to be no choice except to discard the theory of climatic uniformity so far as Palestine and Syria are concerned.

The distribution, location and water supply of ancient ruins furnish evidence which leads to the same conclusion. Lack of space and the present dearth of detailed observations bearing directly upon the subject have made it necessary to confine our attention to a single example. In the case of Palmyra it has been suggested that the present lack of water is due to the destruction of ancient aqueducts of great extent, or to the action of earthquakes, but not one of the score or more of travellers who have described the place gives any basis for such assumptions. Nor would these assumptions explain the sulphurous character of the water to-day, or the presence of a slight amount of sweet water in times of relatively abundant rainfall. In the old days all the water appears to have been sweet, although the major part of it came from the very aqueducts which are now most strongly impregnated with sulphur. In Palmyra, as in many other places, all the facts are easily explained on the hypothesis of a change of climate; while on any other hypothesis yet proposed some fact or other remains inexplicable.

From a general review of all the main lines of evidence thus far studied it appears that there are some lines which prove unfruitful

because they lead to no definite conclusion in favour of any of the four climatic hypotheses. There are others which exclude the hypotheses of uniformity and of change due to deforestation. None of the evidence conflicts with the hypotheses of progressive and of pulsatory change. A choice must therefore be made between these two. In the evidence presented in this article the only fact which bears on this point is the rapid fall of Palmyra and its later rise in the Middle Ages. This suggests a time of peculiar aridity from about the fifth or sixth to the seventh century. So far as is here set forth, however, either theory is consistent with the facts of the history of Palmyra. It is only by appealing to other regions or to lines of evidence not yet fully studied that we can settle the matter. In central Asia, Persia and the Caspian basin there appear to have been pulsatory changes of climate. The same is probably true of Palestine.

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THE SOUTHERN CAMPOS OF BRAZIL.

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The few American tourists who visit Brazil usually content themselves with a stay of two or three days in Rio de Janeiro, and then continue their journey south by the next steamer for Montevideo or Buenos Aires, perhaps going ashore for a few hours at Santos, if the boat happens to stop there. Brazil is then considered as having been "done." While but little of this immense country can be easily visited, owing to the lack of railroads, yet there are parts of the southern States, not far from the ocean, which may be seen without difficulty. These districts are not only of considerable interest to-day, but are destined to be of great economic importance in the future. A recent hurried trip across the Brazilian States of São Paulo and Paraná gave an excellent opportunity to see the typical campos country, and also to inspect, under very favourable conditions, some of the most important railroad construction which is now going on in Brazil. Railroad development throughout South America is attracting more and more attention, especially in the United States, but it is difficult to obtain definite information in regard to the actual state of things without visiting the country. Reports that this or that connection has been made, or will be completed by a certain

date, constantly find their way into print; but on investigation such statements very often prove to be untrue. It may interest readers of the BULLETIN to know something about what two Brazilian railroads, under American management, are doing to-day in the way of actual construction. The trip described in this letter was made by the writer between July 22 and 29, as a member of the "Shaler Memorial Expedition to South America."

Instead of making the trip from Rio de Janeiro southward by steamer, it is far better to travel at least as far as São Paulo by the day train on the Central Railway, a road owned by the Government and forming a part of one of the largest railway systems in Brazil. The train leaves Rio at seven in the morning. If the traveller takes the journey in winter, he will leave his hotel before sunrise, and see the workmen sipping their little cups of black coffee at the cafés which line the streets on the way to the station. The day train is usually empty, as the journey is dusty, and all who can go by night do so. Out through the early morning fogs the train runs, past little groves of oranges, bananas and palms, with neat stone, stucco or adobe houses peeping out here and there, surrounded by patches of vegetables; up the slopes of the Serra do Mar into the bright morning sunshine, through a rough, grass-covered country, thinly settled, mostly by negroes, and of little economic importance as yet. At the stations may be seen the typical products of the country which is tributary to the railroad: flat, circular cheeses; salt pork and live poultry, all packed in baskets made of the indispensable bamboo. At one station one may buy the old-fashioned native *beijú*, flat, thin cakes of manioc, white and tasteless, but doubtless very nourishing.

For most of the day the train runs southward, following a wide valley between two mountain ranges, through a region which has played an important part in the history of Brazilian coffee production. A generation ago this was all a very rich coffee district. Coffee plantations covered the slopes of many of the hills; fine old country estates (fazendas), with their drying-grounds, sugar mills and slave quarters, were scattered here and there amid groves of palms and bananas; fortunes were made, and spent freely in European capitals. But when the rich red earths (*terra roxa*) of the São Paulo country were later found to give the best conditions for coffee culture, these old plantations further north were abandoned. To-day, for miles and miles, one may see from the car window, on the brown hillsides, the regular furrows of the old coffee plantations, or even the trees, which were left behind when the owners moved away, and which are now dying or dead. To-day the ruins of these

fine old fazendas are seen, shaded by their palm-groves, as of old, and with their slave-quarters built around a central court-yard so that the slaves could be locked up at night—all falling to pieces. Even the old family burying-grounds share in the general decay. Here and there a few negro "squatters," descendants of the slaves who formerly worked on these very plantations, live on in the midst of the general ruin. A little coffee is still grown here, and cattle-raising and dairying are being taken up, but the country is dry in winter, and does not interest the traveller, except on account of its past history. In summer, when the rains come, the grass is green, and the hillsides are covered with flowers. A little sugar-cane, some corn, some bananas, and beans and manioc are grown, and everywhere is seen the *capim melado,* or *catingueiro,* the characteristic pasture-plant of Brazil. In the distance, the wooded slopes of the Serra da Mantiqueira are attractive, with their green trees, and Itatiaya, the highest mountain in Brazil (about 10,000 feet) is a prominent landmark. About half-way between Rio de Janeiro and São Paulo Americans will be interested in seeing an experimental rice farm, with irrigation, which is being carried on by a Texas man, under the auspices of the State Government of São Paulo. Near the city of São Paulo the coffee plantations increase in number, and are better kept, pineapples, oranges and vegetables are grown, and there is a general air of prosperity which is singularly lacking in most of the country which was passed over during the day. The market gardens around the city are irrigated by means of appliances which at once remind one of the Egyptian *shadoof,* along the Nile.

The city of São Paulo, while not on the ocean, is one of the most important places in Brazil. Most of its population is of foreign birth or parentage, Germans and Italians predominating. It is full of business; has attractive shops, and its new residence quarter is very pleasing, the houses being surrounded by their own gardens in which many imported trees, shrubs and flowers are seen, although the native palm and the banana hold their place as of first importance. On one of the principal squares of the city, at night, the brilliant electric signs, "Light and Power," on one of the buildings, will impress upon the traveller the fact that foreign capital has something to do with the development of São Paulo, the "São Paulo Tramway, Light and Power Company" owning all the car lines in the city, and furnishing electricity for light and power as well. The climate of São Paulo is preferable to that of Rio at all seasons. In winter the nights are much cooler than those of the capital, hence more refreshing, and the days are fine and warm.

From São Paulo, out to the southwest, runs a railway—the Sorocabana—over which, in the future, will come the through trains between Uruguay and Rio de Janeiro. The Sorocabana is very soon to be connected, off to the southwest, with the São Paulo and Rio Grande Railroad, and the São Paulo and Rio Grande is pushing its line still farther out to the southwest, towards Uruguay. Leaving São Paulo at 5:45 in the morning, the traveller is landed, about 7:00 in the evening, tired, but immensely impressed with the vastness of the campos and their future possibilities, in the midst of the half-dozen small houses which make up the town of Bury, the present terminus of the Sorocabana Railway. If he is as fortunate as the writer, he will travel in a private car and without expense of the railroad fare, but the interest of the journey is well worth the price of the ticket and the discomfort of the ordinary railroad car. The fussy traveller may, perhaps, derive some consolation from the rules of the company which oblige everyone who occupies a first-class car to wear boots! The first hour or so of this journey gives a view of a rugged country, well-watered and well-wooded in places, very little cultivated, producing at present little besides cattle and hogs. Near Sorocaba, from which the railroad takes its name, there are two or three cotton factories, run by water power. Some cotton is grown in the vicinity, but not enough to supply the local mills, the additional amount being brought from Pernambuco, on the northeastern coast of Brazil. During our Civil War much cotton was profitably grown along the Sorocabana Railway; in fact, the first part of the road was built chiefly on account of the cotton. After the War, and especially when coffee was found to be so successful farther north, cotton-growing was largely abandoned in southern Brazil. Some coffee is grown here and there on the uplands of southern Brazil.

After passing Sorocaba, the traveller has his first view of the typical Brazilian campos. For days and days, west, northwest, southwest, he may journey over these wonderful rolling prairies, with their millions of ant-hills, stretching on and on, monotonous yet constantly changing; brown and dry and unattractive here; thickly forested there; elsewhere covered with low, scattering, scrubby trees and shrubs which give the appearance of a New England apple orchard, abandoned, with its trees dying or dead. These campos cover fully three-fourths of all Brazil. For miles and miles the train runs through open country, covered with coarse, grayish-brown bunch-grass, and perhaps not a tree in sight. In the distance these brown fields look like our own pastures, dried by the August sun.

Then suddenly a change comes, and a dense tree-cover shades the tracks, the forest-edge being as sharply marked against the open country as if man had been at work there with his axe. Through the woods the train hurries on, the tall trees hung with long bunches of gray moss ("old man's beard"); covered with creepers which trail down like thick ropes; carrying parasitic plants of many kinds on their branches, and down on the forest floor a thick undergrowth of low shrubs, ferns and bamboo. One form of the latter sends up long, thin stalks which bend down of their own weight and, reaching the ground again, form a complete and very symmetrical arch which has the appearance of a wire trellis, overgrown with vines. After the forest may come an immense stretch of grass-land, with scattering trees and underbrush or stemless palms, and this may be followed by more forest, or by a wholly treeless region. Thus the day goes on, monotony, but variety; a constant repetition of the same landscape, but a constant change. Very thinly settled these campos are. Sometimes for an hour one may not see a house or even a living thing. Then comes an adobe hut, with a thatched roof, a few banana and orange trees; a little patch of poorly cultivated ground, with sugar-cane, beans and manioc; or a collection of somewhat better houses, around some railroad station; or, perhaps, in rarer cases, a larger fazenda, with its outhouses and cattle and grove of trees. Fire has left its mark on vast stretches of these campos, where tall, bare tree-trunks are standing, much as on the pine barrens of Newfoundland. Smoke from these fires may often be seen in the distance, or the train may run for miles through stretches of burning grass. After the fire comes usually a dense growth of coarse ferns, and then the grass clumps of the campos.

At Boituva, a small collection of low stucco and adobe houses, the traveller to the southwest changes cars. As he stands looking at the village, waiting for his train to start, he may perhaps see, in his mind's eye, a future metropolis. For Boituva is the junction for the lines running to the west and northwest, and some day there will be a transcontinental railroad line running from here across Matto Grosso, the great western State of Brazil, up to Bolivia, connecting through that country with the lines to the Pacific Ocean. On a quiet Sunday afternoon in Petropolis, the writer had the opportunity to look over the maps, profiles and photographs secured by the railroad survey which recently went out, for 600 miles west to the Bolivian frontier, across a new country, to lay out this projected railway line. Among the photographs were those of two laborers, attached to the survey party, who had been attacked one night by

Indians. One of these men died; the other recovered, although badly injured. The story, as told by the geologist of the survey, sounded like the tales of our own West, not many years ago.

In the afternoon, when the sun is getting low, the campos are at their best. The heat and glare of the noon hours are forgotten. The air is cool, dry and bracing. The long shadows and soft colors give these immense plains a beauty which lives long in the memory. The heat and glare of the noon hours are forgotten. An occasional araucaria, the characteristic tree of southern Brazil, is seen here and there. The birds come out of the thickets, the insects begin to fly about, and the dry and hot campo, which has been singularly dead all day, wakes up. The last two or three hours of the journey are over the newest portion of the Sorocabana Railway, which has only been open to traffic within a few months. In fact, the last stopping-place has so recently been added that it does not yet appear on the time-tables. Stations and section-houses are passed bearing the date 1905, then 1906, then 1907, and finally one, not yet completed, is marked 1908. Very lonely these last few buildings look, separated by miles of wooded country, surrounded by their little settlements of laborers' huts. Bury, where the train finally stops, after dark, had better make the most of its present distinction, for when the railroad goes farther, no traveller will ever choose to stop there. The "Grande Hotel da Palmeira," at Bury, is "grande" in name only, but it furnished sufficient protection against a heavy rain, and its minute cell-like bedrooms, without windows and without other floors than Mother Earth affords, were preferable to a night spent in the open. This storm gave the first heavy rainfall noted at Bury since March.

Beyond Bury, to the southwest, the rails are laid for a distance of about ten miles, but the road is only partly ballasted, and is not yet open for traffic. The constructing engineers of the Sorocabana Railway provided a special train, consisting of a locomotive and a flat-car, and on this the party proceeded to the end of the line out across the campos, past the camps of the laborers. Here in Brazil the railroad laborers usually take their wives and children with them, and each camp therefore looks like a permanent settlement. The cooking is done in clay ovens set up on wooden platforms, outside the huts. Abandoned white ant-hills are sometimes used as ovens. The gauge of this railroad is one meter, the usual standard in Brazil; the ties are of *peroba,* one of the most common and most useful woods of the country; the locomotives are Baldwins, burning coal briquettes from Cardiff. From Bury to Itararé, a distance of

about 60 or more miles, most of the grading has already been done for the railroad. As you travel along the trail, up and down over the campos, you keep catching sight of the railroad construction, its picturesque red embankments crossing the hollows, and its deep cuttings gashing the gently rounded hills. Every few miles you see the camp of one of the construction gangs. There is no doubt that this is a South American railroad which is being put through.

The gap between the Sorocabana and São Paulo and Rio Grande Railways must now be crossed on mule-back, or by trolley. The Brazilian "trolley" is not our trolley, but it is almost as useful a means of conveyance. Imagine a buckboard, of the crudest description, built in the heaviest fashion, with a small seat for the driver in front, and a seat for two, or, at a pinch, three, passengers behind, drawn by four mules—and you have a picture of the trolley that now carries passengers across the trail where in less than a year regular trains will be running, and where in time there will be through cars from the Rio de la Plata to Rio de Janeiro. Wonderful conveyances these trolleys are. They stand the roughest roads, and lean over until one's baggage slides out, but they never upset. They serve their purpose so well that everyone who travels on a trolley down here, across the Brazilian campos, learns to respect the vehicle.

For most of two days the journey was continued over the old trail leading from Paraná up to São Paulo, across the campos, with their great open stretches and their belts of trees; their lonely herds of cattle and their widely scattered huts; their thousands upon thousands of square miles of wasted land. Over this trail come the pack-trains of mules going north to the railroad. Over this trail come the great covered prairie-schooners from Paraná, filled with the products of the south, drawn by five or even ten horses, carrying whole families of Polaks with their cooking-utensils and other household goods. These people camp where night overtakes them, prepare their meal of black beans, farina, sometimes a little dried beef, and the inevitable coffee, and go to sleep in or under their wagons. The national foods of Brazil are singularly adapted to such simple and ready preparation, and are palatable and nourishing. Where one finds black beans, and farina, and rice, he is sure of a good meal, and one that will sustain him for a long time. Farther north, where palms are common, a much-used and delicious vegetable is boiled young palm-leaf shoots. Over this same Paraná trail come the clumsy ox-carts, their solid, spokeless wheels made out of a large tree-trunk, the wheels and the axle turning together

with a loud creaking sound which is heard for miles across the open country. Over this trail, too, come great droves of black pigs, driven northward to the railroad, to be shipped by train to São Paulo. Driving across the campos at night one comes across, at some point where there is water and wood, an encampment of these travelling merchants and drivers, sleeping on the ground, the animals turned loose to graze, and the light of the camp-fire illuminating the picturesque scene. Occasionally there is a rough shelter, free to all passers by, in which the animals and their drivers spend the night.

Late one afternoon in July, a thunderstorm came up over the campos from the south—a tremendous bank of blue-black cumulo-nimbus cloud, with a long, gray rolling squall-cloud below. In ten minutes this storm gave a rainfall which washed out gullies in the road, in places three or four feet deep. Hailstones, as large as marbles, and some larger than ordinary marbles, fell in such quantity for a few minutes that the mules refused to face the bombardment, and the hail collected in hollows along the road in masses that could easily have been shoveled up. The wheels of the trolley crunched through hailstones for some time after the storm was over, and one hollow, where there had a few minutes before been a small, shallow stream, was filled up with a mixture of water, mud and hail to such a depth that the "trolley" was nearly carried away. The last three hours of the drive after the storm were spent in the dark, driving along a road washed out everywhere by the rain so that now this wheel and now that would suddenly drop down two or three feet. The soft red soil was so slippery that, going down the steep hills, the wheels slipped even with the brake on. Faxina, with a good dinner at its Italian hotel, was reached late in the evening. Poor Faxina! It has for years been living in the hope that it would some day be a metropolis on the direct railroad line from Uruguay to Rio. The Italian hotel-keeper came there with that hope. He is still there, but the hope has been blasted. The engineers have decreed that the railroad shall go no nearer Faxina than two miles; that the town is dead and unimportant, and not worth any extra expense of railroad construction. So the people of Faxina are bitterly disappointed, and the Italian inn-keeper shrugs his shoulders and says that he will sell out and end his days in Paris.

From Faxina southwest to the present terminus of the São Paulo and Rio Grande Railway is 32 miles across the campos. The trip takes about twelve hours, up and down the rolling hills, fording streams, avoiding the worst wash-outs and never even stopping to

feed the mules. The animals, like the people, live on two meals a day. Hour after hour the road winds on, the scene always the same, yet always changing; miles upon miles of fenceless campos, cut across here and there by deep ditches to keep the cattle from wandering too far; clump after clump of closely tangled tree-growth, with the fine araucarias coming in more and more as one travels southward, with their tall trunks and umbrella-like tops; fewer and fewer palms, and bananas, and coffee plants.

At Itararé, in the State of São Paulo, but close to the border of the adjoining State of Paraná, the traveller finds a hotel kept by an enterprising Brazilian who has lived in "the States," and who knows what cleanliness is. This landlord apologized for an excellent meal which he served by saying that in time he would be able to give his guests Boston baked beans. The rails of the São Paulo and Rio Grande Railway are laid from Itararé on into the State of Paraná, but the first fifty miles were not open to traffic in July, although ready for use. Over this piece of road the journey was continued by special train, in a private car, through the courtesy of the division engineer of the railroad. Very picturesque is this piece of railroad, crossing the deep gorge of the Itararé River where future through trains will doubtless stop to give the passengers a view; cutting through great forests of araucaria, and winding up and down the hills with splendid views over the open lower country. One of the engineers said: "This is a fine country, but a poor one to build railroads in." A stop was made at a contractor's camp, in the heart of the Paraná forest, where the usual black coffee was served, and additional stops were made wherever the geologists of the party wanted to examine an outcrop or cutting. Throughout this region many of the laborers are Polaks, imported from Europe by the railroad contractors. These men have proved satisfactory, and many of them are settling permanently in the country. Throughout much of the Paraná country wood is very abundant. The locomotives all burn wood, and piles of cord-wood and of pine-knots may be seen along the railroad track. Forest fires are inevitable under these conditions, but the time is far distant in Paraná when there will be any demand for the preservation of the forests. Another night spent on the road, in the railroad office building at Jaguariahyva, and another day in a special car attached to the regular train to Ponta Grossa, brings the traveller, through a country chiefly given up to lumbering and cattle-raising, to a reasonable stopping-place for his hurried tour of inspection.

Ponta Grossa is one of the principal towns of the State of Paraná,

and is built on a gently sloping, treeless hill, in the midst of the campos. From this centre one may, if time allows, continue the railroad journey somewhat farther towards the southwest, over the São Paulo and Rio Grande Railway in the direction of Uruguay, but travellers will generally prefer to take the train down to the coast at Paranagua, and proceed thence by steamer north to Rio de Janeiro, or south to Buenos Aires.

The trip above outlined was made in a week, from Rio to Ponta Grossa, with stops of thirty-six hours in São Paulo and in Faxina, and is singularly instructive in giving a vivid picture of the present conditions in this great southern portion of Brazil.

The one question which is borne in upon the observing traveller, every hour of the day, is this: What is to be the future of these vast campos? To-day, they are simply examples of a colossal waste—waste of space; waste of soil; waste of rainfall; waste of sunshine. Fire devastates them, far and wide. Coarse grass, not eaten by cattle, covers square mile after square mile. Only here and there, at long intervals, at some lonely hut, is there any attempt to make the soil produce anything except the natural grass; only occasionally is there seen a small herd of cattle or horses; only at long distances apart are there towns. Yet these great campos certainly have a future. The railroad cuts and embankments are prophetic of that future. Nature has provided a climate better than that of much of the western United States. The high temperature and abundant rainfall of the summer are followed by glorious bright, warm days and cool nights in the dry winter. There are drawbacks, of course. The dry season, the heavy thunderstorms, the hail, the frost are to be reckoned with. But where the red soil is ploughed and worked, it yields good grass for cattle and horses. Even now, thousands of cattle and horses could be pastured where all is still waste land. Where the people have tried, in the towns and around their huts, vegetables are successfully raised to-day. The problem is essentially one of time, and labor, and intelligent adaptation of crops to the climatic conditions. Cattle and sheep-raising, and later farming, will come. Experiment stations must be established at various points. Wheat and cereals of different kinds can surely be found which will do well under the conditions of climate and soil which here exist. So far, practically nothing has been done in this direction.

But these campos are no more unpromising than was, a few years ago, much of our own Western country, where to-day are seen fields of wheat, or of corn, or of alfalfa. The shriek of the locomotive will

mean the beginning of the development of this country. A farming and cattle-raising population must come in, as it came into our West. What is needed is a large influx of sturdy peasants from the north of Europe, who will not be afraid of hard work; who will intelligently till the soil and care for their crops; who will adjust their crops to their environment.

He who travels to-day across the southern campos of Brazil will have his horizon immensely widened; will catch a spirit of South American growth and development not to be found in books; will have a vision of the time, in the not far distant future, when these campos will be covered with farms, and support a prosperous, thrifty and intelligent population.

Ponta Grossa,
State of Paraná,
Brazil.
Aug. 1, 1908.

TEN DAYS IN CAMP ON MT. PELÉ, MARTINIQUE.*

The Volcano Six Years after the Great Eruption.

BY

EDMUND OTIS HOVEY.

When the news was flashed all over the world early in May, 1902, that Mt. Pelé, Martinique, and the Soufrière, St. Vincent, supposedly extinct volcanoes in the Caribbean Islands, had broken out in violent eruption, killing thousands of human beings and devastating great areas of land, geologists, magazine writers, and artists, as well as newspaper reporters, were hurriedly sent to the scene from France, England and America.

The experiences of the weeks spent on and near the great volcanoes were sufficiently varied, exciting and dangerous to satisfy the most eager pursuer of the sensational, and Mt. Pelé and its eruptions were studied, described and photographed as no volcano had ever been before. Scientific and even popular interest in the mountain were actively continued by the great dome and "spine" of lava that were pushed up in strange fashion in the midst of the old crater

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FIG. 1.—SAINT PIERRE FROM PEDESTAL OF STATUE OF THE VIRGIN ON MORNE D'ORANGE. FEBRUARY, 1903.

of Mt. Pelé the following autumn and maintained there at strangely varying altitudes for several months.

Six years and more have now elapsed since the eruption began, and many changes have taken place in the islands. The "spine" of Pelé literally fell to pieces in the latter part of 1903, and the last real puff from the volcano occurred in July, 1905, while the Soufrière quieted down so much after the outburst of March 26, 1903, that not even a vestige of steam could be seen two years later. Erosion under tropical rains goes forward rapidly on barren or deforested slopes, while vegetation gains foothold quickly in the tropics. Hence, in the Spring of 1908, the American Museum of Natural History sent me for the third time to the islands to observe the changes that had taken place and to collect specimens from localities, particularly the dome of Pelé, that were inaccessible on the previous visits.

Towns and plantations are so far from the field in both islands that much valuable time is lost in unproductive walking or riding, hence I decided to attempt to camp out on the mountains. My wife accompanied me, and we carried out our project so satisfactorily that an account of our experiences may be worth while. We took waterproof tents, tools, camp outfit and provisions with us from New York, so that we could be entirely independent, if need be, of any supplies to be found in the islands. We even carried with us alcohol for all fuel, because the regions to be occupied are entirely destitute of wood or charcoal. Everything had to be arranged in packages not exceeding 60 to 75 pounds in weight, since the whole outfit was to be carried some miles at each locality on men's heads.

We landed at Fort de France, the capital and metropolis of Martinique, on the 27th of April, and proceeded toward St. Pierre two days later by the little coasting steamer, of exceedingly unsavoury odor, called the "Diamant." This boat landed us with our outfit at Le Carbet, a village two and one-half miles south of our destination. From Le Carbet we had to go by canoe to the ruined city. On account of our camp outfit we had so much baggage that we were quite anxious for its safety in the apparently frail craft that the natives use for travel and fishing. The sea was calm, however, no accident happened to us or our things, and, in the course of an hour, we reached the little hotel which has been built on Rue Victor Hugo, the old main street of St. Pierre, beside the Place Bertin, once the beautiful seaside park of the city. The "hotel" is extremely modest in size, appearance and appointments, containing only two sleeping-rooms for guests, besides the dining-room, the office and a

little store; but one can spend a night or two here or even a longer time in comfort, though St. Pierre is still hotter in its ruined condition than it was in its prosperity, and the city was always notorious for its heat.

Aside from the presence of the hotel, there are not many signs of resuscitating the city. Rue Victor Hugo has been cleared of ash throughout its length, also the streets connecting with the roads to Morne Rouge and Fort de France, the street leading to the old cemetery behind the Church of the Anchorage and that leading to

FIG. 2.—SAINT PIERRE, MAY, 1908. MONT PELÉ, RUE VICTOR HUGO, ETC., FROM THE HOTEL PIAZZA.

the ruins of the bank, where the headquarters of the police have been established. Here and there a building has been cleared of *débris* in order to rescue articles or material of value, but the work thus far done is only enough to show the more than herculean nature of the task of clearing the city of from three to twelve feet of filling due to the eruption and following events, and the job is not likely soon to be undertaken systematically. In one of the cleared buildings, near the Lasserre distillery in the southern part of town, a squatter has put up and occupies a little shanty; in another, near the hotel, the "village blacksmith" has established his shop. A substantial wooden pier has been built near the site of the lighthouse

on Place Bertin, and regular steamboat service with Fort de France was to be established in June. The city is the picture of desolation, looking to me more hopeless of rebuilding within a generation than it did directly after the great eruptions. Most of the walls then standing have fallen, adding much to the *débris* contributed by the volcano and to that washed down from the hills surrounding the city, and grass and bushes are growing everywhere amid the ruins. The place looks as if the city had been destroyed a century ago, rather than only six years since.

St. Pierre, however, is the natural outlet for a large and produc-

FIG. 3.—MONT PELÉ, MAY, 1908. FROM THE SOUTHWEST. NEW CONE WITH FUMAROLES. GREAT V-SHAPED CLEFT LEADING DOWN INTO RIVIÈRE BLANCHE.

tive agricultural region, and somewhat of a town is sure to grow up here, as confidence in the quiescence of the volcano increases, though many years must elapse before the city regains any of its old commercial importance. The people of Martinique are afraid of "la Montagne Pelée," and with good reason; but there is no probability of a recurrence of the terrific blast that swept over the site six years ago. Prior to May 8, 1902, Mt. Pelé had a great open crater, similar to those now existing on the islands of Nevis and Montserrat, about five-eighths of a mile across and 2,100 feet deep beneath Morne Lacroix, the highest point of its rim. The southwest wall of the

crater was breached to its bottom with a V-shaped cleft opening into the head of the gorge of the Rivière Blanche. When the great explosion occurred at 7:45 A.M., May 8, 1902, its expansive force was opposed on the north, east and southeast by the solid walls of the crater, which added strength and gave direction to the portion of the cloud issuing through the cleft. The cleft was in the side of the mountain toward St. Pierre. Now a vast new cone, largely composed of solid rock, practically fills the old crater and rises about 400 feet above the highest part of its rim. There is no directive cleft in

FIG. 4.—MONT PELÉ, MAY, 1908. THE NEW CONE FORMED OF ROCKS AND DÉBRIS OF THE OLD SPINE. CAMP IN BASIN OF THE LAC DES PALMISTES.

high walls to concentrate any part of an eruption cloud into a definite blast, and ruin would be wrought in all directions, as on August 30, 1902, the degree depending upon the initial violence of the explosion, and the distribution upon the exact location of the vent or vents. At the distance of St. Pierre such an eruption might give a heavy deposit of ash, but would not be liable to destroy property or life south of the mouth of the Roxelane River.

After two days spent amid the ruins of the city and in visiting the government volcano observatory and weather station at Morne des Cadets, about three miles east of St. Pierre, now under the able

direction of M. L. Guinoiseau, formerly adjutant of artillery in the French army, we started with our camp outfit for the Rivière Blanche, to establish ourselves at as high a point as possible on the western flank of the mountain. Seven porters walked along the shore, while we proceeded leisurely by water in a good "built-up dug-out" canoe with two oarsmen and a steerer. Two hundred yards or more north of the site of the Guérin sugar factory, the first victim of Pelé's wrath, we beached our boat, and our packages were soon on the ground, where the porters overhauled them carefully and sorted them out for transportation up the slope. It was interesting to see the men go about testing different combinations to make sure that the loads were as nearly uniform as possible, and the animated discussion that ensued was like the chattering of magpies. The leader considered my camera box heavy enough to constitute a load by itself, but some of the men to whose lot two packages had fallen thought otherwise. They changed their minds, however, when they went over and tested the camera box for themselves, and the procession up the ash-filled river bed finally began, each porter carrying one or two packages on his head.

The V-shaped cleft opening from the crater into the head of the deep gorge of the Rivière Blanche was the outlet for hundreds of dust-laden, exploding steam clouds during the three-year period of eruptive activity that began in May, 1902. These left behind millions of cubic yards of fragments varying in size from the finest dust to blocks 30 feet across, filling the gorge like a stream of some strange fluid which congealed as it ran. The exact depth of the cañon existing here before the eruptions is not known; hence the depth of the new deposit of ash can only be estimated, but there is good reason for thinking it to be not less than 500 feet deep in places. In March, 1903, the surface of this slope consisted of dry, almost impalpable dust scattered over with large blocks. Into the dust one sank half-way to the knee at almost every step, and the already difficult progress was rendered extremely disagreeable in the tropical heat by the whirlwinds coursing through the valley and driving the dust into one's face. Now all this fine dust has been washed away or cemented into tenacious cakes that resist farther erosion, and progress is comparatively easy for three miles or more up the line of the old gorge. At this distance from the sea the deep ravine with vertical sides that has been cut along the left wall of the old gorge crosses to the other wall and, in connection with other higher ravines, renders impracticable the attainment of the top of the cone by this route.

About two miles from the coast M. Guinoiseau, who accompanied us, pointed out the little sand plain twelve hundred feet above the sea where we could best make our camp. We halted in the broiling sun and awaited the arrival of our perspiring porters, who had found the ascent under a cloudless sky decidedly hot, and straggled rather slowly in. After a few minutes of rest and a drink all around from the demijohn of water "headed" up by one of the men, they recovered their breath and we set up our tents and made camp. There was not a stick of wood for a tent-pin within four miles of our camp-site, but rocks were abundant and made good anchors for the tents.

FIG. 5.—MT. PELÉ, MAY, 1908. RIVIÈRE BLANCHE CAMP. PORTERS WITH BAGGAGE AND CAMP EQUIPMENT.

The chief difficulty with this Rivière Blanche camp was the lack of water. The nearest source of good supply was at sea-level and more than four miles distant, and one porter was kept busy a good part of each day trudging back and forth with the demijohn. We surprised ourselves by learning the small amount of water with which we could get along under such circumstances. In spite of the fact that the rainy season was supposed to have begun, we did not collect more than half a gallon of water altogether from our tent roofs and two large collecting cloths during the four nights spent at this camp. We used alcohol stoves for most of our cooking, but we pressed the

internal heat of the earth into service too. Our camp was beside the lower end of the fumarole area a quarter of a mile or more long that exists in the divide between the Rivière Blanche and the Rivière Claire, and about 50 yards from our tents we found one that was just right for boiling all kinds of food. Here we dug a hole large enough for a camp kettle and did part of our cooking in it. If we had only known in advance the convenient location of these fumaroles we might have left alcohol stoves at home!

These vents are arranged in a line practically radial to the crater, and they vary in temperature from 68 degrees centigrade (154 degrees Fahrenheit), at the opening furthest from the crater, to 305 degrees centigrade (581 degrees Fahrenheit), at those nearest to it. The highest fumaroles in both temperature and position are about a mile horizontally from the central conduit of the volcano, if there is one. Their position, high temperatures six years after the eruption that deposited the ash in which they actually occur and their sympathetic increase and decrease in temperature with the increase and decrease of activity of the volcano itself indicate that they are probably not secondary steam vents releasing heat from the interior of a superficial ash bed, but that they may be true fumaroles, connecting through deep fissures with the internal heat of the earth. The character of the vents, however, is still open to some dispute. As far as known, these and a (probably) secondary fumarole in the ravine of the Blanche are the only steam vents now existing in the mountain aside from those in the cone and crater itself. For many months after the volcano renewed its severe activity the great deposits of hot ash in the valleys of the Claire, Blanche, Sèche and Falaise rivers and on the plateau between the Blanche and the Sèche rivers steamed vigorously and even had localized outlets from which great columns of steam rose when rain or river water penetrated to the heated interior of the beds. These vents, however, were secondary affairs and, having no deep-seated source of heat or any connection through fissures with the volcanic conduit, ceased their activity entirely, with the single apparent exception just noted, as soon as the ash cooled down to the normal temperature of the surface earth.

The immediate surroundings of our camp were impressive from their absolute desolation. We were on what had originally been a narrow divide between the deep gorge of the Rivière Blanche on the southeast and that of the Rivière Claire on the northwest, but the "divide" was gone, for at this point the gorge of the Blanche was completely filled with volcanic *débris,* and some of the material had literally flowed over into the Claire. There was no vegetation here and

no animal life, not even a fly or a mosquito, while the gently steaming fumaroles gave a weird aspect to the whole that was intensified in the half-light and cool atmosphere of early morning and late afternoon. The sloping plain of the Blanche was thickly strewn with boulders and angular fragments of rock of all sizes with here and there a little patch of sand, but not a sign of life was visible anywhere, not even a blade of grass or an ant. The surrounding hillsides had been scored so deeply and so often by terrific blasts from the crater that they too were barren of vegetation. Our view toward the northeast was the strangest of all, for above the barren slopes in that

FIG. 6.—MONT PELÉ, MAY, 1908. RIVIÈRE BLANCHE CAMP. COOKING OVER A FUMAROLE.

direction was the rough, rude cone of the volcano with its white crown of vigorous fumaroles.

If our surroundings were somewhat depressing during the day from their deadness and from their unmitigated reflection of the dreadful sunlight, they were entrancing in their wealth of colour when touched by the rays of the setting sun. Reds, yellows, browns, purples were there in constantly shifting shades, enough to be the despair of the artist and the delight of the average mortal. Best of all, perhaps, was the scene under the brilliant light of the moon, whose silver rays softened marvelously the harsh outlines of barren rock and denuded cliff. Starlight, too, gave us another variation,

when the weirdness of black bluff and gorge was intensified by the thought of the great and still active volcano so near at hand, which not long ago sent hundreds of superheated blasts over the very spot where our tents were standing.

From the "Hôtel des Fumerolles," as we called our camp, being in a French island, I made geological excursions all over the southwestern side of the mountain and up to its summit plateau, the basin

FIG. 7.—MONT PELÉ, MARCH 26, 1903. THE GREAT SPINE OR OBELISK THAT SURMOUNTED THE NEW CONE WITHIN THE CRATER. THIS MASS OF NEW LAVA EXUDED IN EXTREMELY VISCOUS CONDITION, TOO VISCOUS TO FORM AN ORDINARY FLOW. AT THE DATE GIVEN IT STOOD 358 METRES (1,174 FEET) ABOVE THE CRATER RIM AT THE LEFT OF THE MAN.

of the former Lac des Palmistes, by way of the ridges southeast of the Rivière Blanche, following the route traversed twice by Mr. George C. Curtis and myself in June, 1902, at the peril of our lives. In the past six years erosion has done a tremendous amount of work on the slopes and in the gorges of the denuded mountain. Old waterways have been widened and new ones have been cut, com-

pletely changing the surface features of the region in many places. Here and there, however, one can see a bit of old pavement or a fragment of wall indicating the location of one of the famous plantations of Martinique, obliterated by the eruption. Even the soil was often erased from the ground, leaving a planed surface of old cemented volcanic ash. This generally remains bare of vegetation, but many protected places and gullies where moisture has stayed longer than elsewhere have given vegetation a chance to start, and grass and bushes have crept half way up the south side of the mountain. The new ash resists decomposition into soil, wherever it re-

FIG. 8.—SAINT PIERRE, MAY, 1908. LOOKING NORTHWEST FROM THE ROUTE TO MORNE D'ORANGE.

mains dry or is well drained, hence vegetation is slow to take root in it. This is particularly true of the mud flows, for they have consolidated into real rock masses. That covering part of the site of the Guérin sugar factory is a barren red bluff of agglomerate rising 15 to 25 feet above the general level of the uneven plain of new ash at the old mouth of the Rivière Blanche.

After finishing for the time being my work on the southwest side of the mountain, we moved camp to the basin of the Lac des Palmistes, the old summit plateau of Mt. Pelé. This was quite an undertaking, for the baggage had to be headed down to the coast, taken by

canoe to St. Pierre, thence by oxcart 17 miles to Capot on the north-east coast of the island, from there by oxcart again four or five miles to about 1,700 feet above the sea on the slopes of the mountain, and the last stage of two or three miles was heading the packages to the summit plateau at about 4,000 feet above the sea, a circuit of 30 miles to move camp less than two miles in a straight line! These distances do not seem very long as one writes them, but their accomplishment consumed much time and labour on account of the grades of the roads and trails and the height to be attained.

The basin of the Lac des Palmistes, the pretty pond that adorned

FIG. 9.—SAINT PIERRE FROM THE ROUTE TO CARBET, MAY, 1908. SHOWS THE GROWTH OF VEGETATION.

the top of the mountain before the eruption, is 4,000 feet above the level of the sea and is covered with clouds more than nine-tenths of the time. We were extremely fortunate in reaching the plateau just as the clouds lifted entirely from the mountain, not only giving us a splendid view of the great new cone within the old crater, the particular object of my study, but also allowing me to choose a camp-site and set up our tents under favourable conditions. We found the spot which had been utilized by the two French engineers who made a topographic survey of the cone and crater in January, 1908, and soon saw that it was the place for us. Here we fell heir to half

a dozen good stakes, but again plenty of big stones were at hand and formed excellent anchors. We had need of them, too, for the wind blew a gale practically all of the five days that we spent on the summit. The whistling of the wind over the sharp edge of the crater rim not 150 yards distant was quite terrifying during the night, before we knew what it was and got used to it. The temperature was much lower at this camp, the "Hôtel du Bassin du Lac des Palmistes," than at the Fumarole Hotel, not rising above 65 degrees during the day and being only 58 or 59 degrees during the night. In spite of the prevailing cloud, our camp on the mountain top was

FIG. 10.—MONT PELÉ, MAY, 1908. BASE OF NEW CONE AT THE LEFT, SPIRAL VALLEY IN CENTRE AND RIM OF OLD CRATER AT THE RIGHT. HEIGHTS OF MACOUBA IN BACKGROUND.

"dry" and we did not catch water enough to wash our hands, hence every day our man had to descend 2,000 feet and tramp three miles and back for our supply of water.

The most peculiar and instructive feature of the eruption of Pelé was the formation within the old crater of the new cone to which reference has been made. The lava of this eruption is of a type that fuses only at a very high temperature, and so much water vapour (steam) came to the surface in connection with the eruption that the lava issued from the vent in a viscous condition and was not sufficiently fluid to flow like the ordinary streams of Vesuvius. The

lava, therefore, welled up through the vent, solidifying as it came and forming a conical mass over the orifice in the bottom of the old crater. In the early days of the eruptions the explosive character of the issuing clouds was so strong and the explosions came so frequently that the cone was destroyed almost as fast as it was made. Still, its top was above the level of the Lac des Palmistes basin a month after the occurrence of the fatal blast that destroyed St. Pierre, somewhat as was observed by Mr. Curtis and myself on our ascent of June 20, 1902.

By October, 1902, the relation between the exploding clouds and the up-welling lava was such that the former kept blowing away only the southwest and the northwest quarters of the cone as fast as or faster than it rose. This left a spire-like needle rising at the northeast side of the cone, with a roof-like ridge running southwestward therefrom at half the height of the spire and completing the likeness of the profile to that of a cathedral. Fissures allowed the extrusion of many smaller and more temporary spines from different parts of the cone. The cone grew at a marvelous rate. According to observations and measurements made from the station at Morne des Cadets, the rise during part of the month of November, 1903, was at the rate of 41 feet per day. From time to time, on the other hand, the cone sank somewhat, or the top fell off, causing a loss of altitude which was regained shortly afterward. At its maximum development, May 31, 1903, the point of the needle or "spine" was 5,304 feet above the level of the sea, or nearly a thousand feet higher than the old summit of the mountain, Morne Lacroix, which was destroyed by the first outburst of the revived volcano. During this period Pelé was the highest mountain in all the Lesser Antilles.

Not content with having erected such a wonderful monument to the dead of St. Pierre, the volcano wrought the destruction of the spine and upper part of the cone a few months later. The disintegration was due to the fact that the spine was brittle and rifted in every direction, although it was composed of rock in place, not of *débris*. It simply could not maintain itself and it fell to pieces. The fragments, 50 to 60 feet across, now lie at the base of the new cone in the spiral valley between that and the wall of the old crater. Nine hundred feet of the mountain top thus fell away, and the present altitude of the apex of the cone is 4,444 feet above sea-level, which is only 16 feet above the height assigned to the old Morne Lacroix.

The climbing of the new cone is not unattended with excitement and difficulty. The trail to it leads westward from the Lac des

Palmistes along the knife-like edge of the old crater rim nearly half a mile and then literally drops into the spiral crater valley, in the bottom of which are the enormous blocks resulting from the breaking to pieces of the great spine. The cone rises from this valley with a slope about 37 degrees from the horizontal upon which rock fragments lie so loosely that the least jar sends them sliding toward the bottom, rendering foothold extremely insecure and the advance

FIG. 11.—MONT PELÉ, MAY, 1903. REMAINS OF MORNE LACROIX AT THE RIGHT, BEARING THE CROSS. SPIRAL CRATER VALLEY AND BASE OF NEW CONE AT THE LEFT.

of a party dangerous to the lower members of it. Half-way up the slope the trail passes through a group of fumaroles whose temperature is below the boiling-point, and here one feels for a few minutes that he is in some sort of a weird Russian bath. The fumaroles of the upper regions are much hotter and one carefully avoids them, while the hottest of all are in the very top, where M. Guinoiseau and I determined, with the aid of my electric pyrometer, the temperature

in a branch of a great fissure to be 515° centigrade, or 959° Fahrenheit. The main fissure probably was hot enough to show visible incandescence at night. There are hundreds of fumaroles in the upper part of the cone and steam issues abundantly from them, but, as far as known, no ash has been thrown out in the past three years. The activity of the mountain has been gradually though intermittently decreasing since the great outburst of August 30, 1902, and there seems to be no present indication of another outbreak. If, however, a new eruption should occur, it would probably take place from the western side of the cone, and be more severe over the leeward than over the windward side of the mountain. The wind usually blows a perfect gale on top of the mountain, so that when one is on the summit and scarcely able to stand, even when strongly braced, he does not wonder at the confidence felt by the natives that the *débris* of an eruption would be driven westward. The wind, however, sometimes fails, and this happened when some of the eruptions took place, so that the ejecta went eastward as well as westward. Now the rock ledges in place occupy only a small part of the surface of the cone, while the fragments broken off from them cover nearly everything.

On the east side of Mt. Pelé vegetation has reasserted itself more strongly than on the southwestern, and the whole landscape is green with young trees, bushes and grass up to an altitude of 3,000 feet, and still higher on the north. As one now traverses the region or looks down upon it from the mountain heights, he can scarcely realize the extent of the barrenness and desolation of only five years ago. The moisture of so much cloud has induced moss to grow over the surface of the summit plateau (the basin of the Lac des Palmistes), and grass grows in the new ravines and in the crevices of the bombs and other boulders. We even picked ripe raspberries from bushes at the top of the trail.

Before leaving la Montagne Pelée, come with me to the "Salon" for a parting view of the weird crater and the vast new cone of the old volcano. The Salon is a nook in the southeast corner of the old crater formed by a small section of the rim that sank at the beginning of a landslide, but that stopped its downward course into the crater when its top was about fifteen feet below its old position. Here one is perfectly sheltered from the terrific wind and may enjoy crater and cone at leisure, if only the clouds lift sufficiently. The narrow spiral valley, 180 feet deep, lies at one's feet and rises gradually toward the north, with the vertical wall of the old crater at the right and the steep slide-rock slope of the new cone at the left. The

meagre remains of the former apex of the mountain, Morne Lacroix, limit this part of the view and the new iron cross on top stands out in bold relief against the sky. The green of the moss-covered crater wall contrasts strongly with the bare rock of the cone, but the cone is beautiful with warm tones of reddish brown and an occasional streak of light yellow from the sulphur deposited by fumaroles, mingled with the general gray of the rock. The blunt top of the cone is a quarter of a mile across, with jagged pinnacles marking the base of the wonderful spine of short but famous history, while a chaplet formed of unnumbered fumaroles gives it a crown of glory. If only one can see this steaming cone in the light of the rising or the setting sun or under the radiance of the full moon, he will carry away with him a picture never to be forgotten and never to be confused with that of any other mountain.

THE NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS.

The Congress was held in Geneva July 27th to August 6th, 1908. This body has convened in the great capitals and other cities of Europe and America, but in none more suitably than in the quiet and beautiful city at the foot of Lake Leman, in the heart of Europe, flanked by the Jura and the Alps, and long a centre of learning and culture. Appropriately also, the sessions were held in the University of Geneva, of worthy antiquity, if not rivalling Bologna and Oxford. In front of the University buildings stands a bust of Carl Vogt and there runs the Rue de Candolle. Not far away is the street named for De Saussure and on the roster of active members of the present Congress occur repeatedly the names of De Candolle, De Saussure, Forel and Favre, reminding the visitor that Geneva has long been and is still a home of geographic knowledge.

The full list of participants included nearly seven hundred names, of which about one hundred and fifty were those of ladies and others accompanying the members of the Congress. A full share of notable names finds place in the record and in the daily discussions: Professor Penck of Berlin, now in this country lecturing at Columbia University; Professors E. de Margerie and Vidal De La Blache of Paris, Professor Brückner of Vienna, Drs. J. Scott Keltie and C. Raymond Beazley of England, Professor George G. Chisholm, newly appointed to the chair of geography in the University of Edinburgh; Prince Roland Bonaparte, Professor Otto Nordenskjöld of Sweden

and many others. Among the Americans present were Professors H. F. Cleland, W. M. Davis, C. R. Dryer, D. W. Johnson, N. M. Fenneman, W. H. Hobbs and A. P. Brigham; Dr. Simon Newcomb, Dr. Anita Newcomb McGee, Mr. Frank Leverett, the Misses Laura and Emily Bell, Mr. Henry G. Bryant, Miss Luella Agnes Owen, Dr. David T. Day and Admiral C. M. Chester.

The Congress had been taking form for many months by the strenuous labours of the President, Dr. Arthur de Claparède of the University of Geneva, many times President of the Geographical Society of Geneva. His devotion to the Congress was unremitting, notwithstanding a long and disturbing illness which confined him to his room during the weeks of active preparation preceding the final organization of the programme.

At the opening of the session addresses were given by M. Brenner, President of the Swiss Confederation, and by M. Fazy, President of the Council of State of Geneva. There were also addresses by Captain Cagni, of the Italian Navy, representing the government delegations; by Professor Gerland, of Strasburg, for the Universities; by Prince Roland Bonaparte on behalf of Geographical Societies, and by Professor W. M. Davis, speaking as a member of the Harvard Travelers' Club, in the name of other institutions and societies. The second general session was noteworthy and offered the following topics: Geographical Education by Councillor of State, M. Rosier; Botany and Replanting, by Professor Flahault, of Montpellier; Leonardo da Vinci and Geography, by Professor Oberhummer, of Vienna, and the report of Professor Penck in relation to the proposed map of the world on the scale of 1 to 1,000.000. Progress was reported and a committee formed which later reached definite conclusions as to conventional signs and other matters. This action was taken in response to a communication from Dr. Henry Gannett, of the United States Geological Survey. Among the conclusions of the committee adopted by the Congress in its session of August 4 were the following: Each sheet to cover an area of 4° in latitude and 6° in longitude, the meridians to be reckoned from Greenwich, the projection to be polyconic, the altitudes to be given in metres, also in feet if desired, and the contour interval to be commonly 200 metres, with variations in flat and in mountainous regions.

An important general session on glacial matters was held under the direction of Professor Brückner and the chief addresses were given by Professors Penck and Brunhes. The latter took up the question of glacial erosion, arguing for the special effectiveness of sub-glacial waters in the making of valleys. The section devoted to

glaciers was marked by large attendance and vigorous discussions. In one of the sessions Professor Brückner took issue with the views of Professor Brunhes.

Polar Exploration received the usual attention. At one general session President de Claparède amid applause resigned the chair to Captain Cagni, and he in turn introduced Mr. Henry G. Bryant, who read a letter from Commander Peary, then *en route* for the north in his new search for the Pole. M. Lecointe, of Belgium, offered a plan for international coöperation in Polar research and described the organization of an International Polar Institute, and the establishment of a Polar museum at Brussels. The Congress adopted a resolution referring the proposed plan for union with the Belgium institution to the several governments concerned. Another general session was given in large part to the "Conquest of the South Pole." The principal address was made by Professor Otto Nordenskjöld, nephew of the great head of the *Vega* expedition.

Among other addresses M. Ch. Lallemand, of Paris, spoke on "La Respiration de la Terre," describing periodic terrestrial tides, or oscillations, as set forth by Professor Eckert, of Potsdam.

Papers by American delegates were as follows: The Physical Geography of the Sea (Admiral Chester), Practical Exercises in Physical Geography (Professor Davis), The Distribution of the Petroleums of the World (Dr. Day), The Missouri River and Its Future Importance to the Nations of Europe (Miss Owen). There were papers by Mr. Bryant on the Polar Expedition of the *Argo* (1753); by Mr. H. L. Bridgman, read by Mr. Bryant, on the Peary Arctic Club; by Professor Hobbs on Equipment for Geographical Teaching, and by Professor Brigham on the Distribution of Population in the United States.

Social doings followed close upon one another and gave to the delegates most gracious greetings by the city and in some of the most delightful homes in Geneva. Thursday, July 30th, was given to a general excursion of the entire Congress in two large steamers chartered for a complete circuit of the Lake of Geneva. Dinner was served at Montreux, Professor Forel gave a brief lecture on the Embouchure of the Rhone, and there were many hours of pleasant converse and acquaintance.

For the next meeting of the Congress there were invitations from Lisbon, Dresden, Budapest, Queensland, and Rome. After an animated debate, Rome was selected by a close vote, the date being 1911, marking the fiftieth anniversary of Italian Independence.

A. P. B.

GEOGRAPHICAL RECORD.

AFRICA.

DIAMONDS IN GERMAN SOUTH-WEST AFRICA.—*The Board of Trade Journal* (No. 621) says that the British Embassy at Berlin reports the announcement of the discovery of a diamond field near Lüderitz Bay. Crystals sent to Amsterdam to be examined have been favourably reported upon. At about the end of August, 2,000 stones had been found, most of them weighing about two-thirds of a carat, though some weighed seven-eighths of a carat and were about the size of peas. The German Colonial Society for South-West Africa has been formed for the working of the mines, and the Imperial Colonial Office has exempted from the general right of digging for minerals the district in which the diamonds have been found in large quantities. In accordance with a decree published in the *Reichs-Kolonialblatt* of Oct. 1, the new Society will acquire complete control of the prospecting for and working of minerals, except as against the already well-established rights of third parties, in the region bounded north by 26° S, on the south by the Orange River, on the west by the Atlantic and on the east by a line parallel to it and 100 kilometers from it.

Another report says that these diamonds did not originate in a blue-earth volcanic formation such as that which yields the Kimberley gems, but, as in Brazil, they occur in granite, the disintegration of which has scattered many of them through the coastal sands. The blue-earth formation, however, has recently been discovered in the colony at Gibeon and diamonds have been found in it.

CLIMATE AND THE VEILS OF THE TUAREGS.—A curious custom prevails among the Tuaregs of the central Saharan plateau, which has frequently been mentioned in geographical literature. These people habitually wear a veil, which is not even removed when they eat and sleep. Only the eyes are visible. This habit of veil-wearing has gained for these people the name of *Ahel-el-litham*, or "people of the veil," and the Arabic name of *Molathemin*, the "veiled." It has generally been believed that the Tuaregs wear their veils as a protection against the fine sand and dust of the desert. In his recent book, "Across Widest Africa," Mr. A. Henry Savage Landor points out that there are also other explanations. Some people say that the veils are worn because the Tuaregs do not wish to be recognized by their enemies. Others give a climatic reason, saying that it is done in order to keep moisture at the entrance of the respiratory organs in the dry atmosphere of the desert. Mr. Landor himself thinks that the habit is merely the outcome of fashion. The women of the Tuaregs never wear veils, and seem in good health.

R. DEC. W.

AMERICA.

PETROLEUM IN ILLINOIS.—Mr. David T. Day, in his report on the "Production of Petroleum in 1907," just published by the U. S. Geological Survey, says that the rapidity with which the Illinois oil field developed was the most surprising feature of the world's petroleum industry in 1907. The existence of petroleum in that State has been recognized for many years and a slight production was

noted; but it was not till 1905 that careful drilling in the neighbourhood of Casey, in Clark County, developed wells sufficiently productive to indicate a large and profitable field. In 1905, the product amounted to only 181,084 barrels. In 1906, this increased to 4,397,050 barrels, and again fivefold in 1907, to 24,281,973 barrels. The entire product came from Crawford, Clark, Lawrence, Cumberland, Coles, and Edgar Counties, most of it from the first three named. Three of these counties front on the Wabash River, the eastern boundary of the southern part of the State and the three others join the Wabash counties on the west.

THE OKLAHOMA GEOLOGICAL SURVEY.—Prof. Charles N. Gould writes in a letter to *Science* (No. 718) that the Oklahoma Geological Survey, established by the first Legislature of the State, will have its headquarters at the State University, Normal, until suitable laboratories, libraries, and apparatus are provided for it. The Survey has begun the preparation of reports on building stone, road material, oil and gas. Several parties were put into the field to secure material for these reports. A geologic map of Oklahoma is being prepared and it is the intention to publish preliminary reports on the oil and gas regions, the available road material, the building stone of the State, and the economic resources of the Arbuckle Mountains.

THE VIRGINIA GEOLOGICAL SURVEY.—This Survey has been established by the General Assembly of the State with headquarters at the University of Virginia, Charlottesville. It is under the direction of a Commission, composed of Gov. Swanson (chairman); President Alderman of the University of Virginia; President Barringer of the Virginia Polytechnic Institute; Superintendent Nichols of the Virginia Military Institute; and A. M. Bowman, of Salem, Va.; Dr. Thomas L. Watson, Professor of Economic Geology in the University of Virginia, has been elected Director; Dr. J. S. Grasty, of the Maryland Geological Survey, assistant geologist; and Mr. Wm. M. Thornton, Jr., of the University of Virginia, chemist. The Survey has begun work on the geology of the coastal plain region, including the underground water resources; cement and cement materials; topography and geology of the Virgilina copper district; geology of the rutile deposits; and building and ornamental stones. The studies of the coastal plain geology and topographic mapping of the Virgilina district are in coöperation with the U. S. Geological Survey.

EXCURSION OF SCIENTIFIC MEN THROUGH THE CANADIAN ROCKY MOUNTAINS.—After the meeting of the British Association for the Advancement of Science at Winnipeg, Can., in the last week of August next year, there will be an excursion by special train to Vancouver, B. C., with stops at Banff, Glacier, and other points. To members of the British and American Associations the trip will be made for one fare, or $50. An excursion from Vancouver to Alaska and, perhaps, to still more distant points is under consideration. The usual dues of a sovereign will be remitted to members of the American Association attending the meetings. It is hoped that the occasion will be notable by reason of the large number of British, Canadian, and American scientists brought together.

THE FIRST PAN-AMERICAN SCIENTIFIC CONGRESS.—This Congress will be held in Santiago under the auspices of the Republic of Chile from Dec. 25, 1908, to Jan. 5, 1909. The literary programme is very long and can scarcely be compressed

into the ten days assigned for the meeting. International law, American economic questions, criminology, literature and art in America, and many other topics will be discussed. Most of the American States will be represented and the sum of $35,000 was appropriated for the representation of our country, headed by Mr. Holmes, the ethnologist. The programme relating to American Anthropology includes many papers.

POPULATION OF CHILE.—The *Bollettino* of the Italian Geographical Society reports (August, 1908) that the official census of Chile taken on Nov. 28, 1907, shows a population of 3,248,224 inhabitants, an increase of 536,079 inhabitants since the census of 1895. Since 1835, the population has increased more than threefold, due almost entirely to natural growth, as immigration has been very small.

ASIA.

THE NEW PEKING.—An article in the London *Times* (Weekly, Oct. 2, 1908) says that to those who knew the Peking of the last decade of the 19th century, the contrast offered by the city of to-day is very striking. In no part of the Empire are there more impressive evidences of fusion and change than those which confront the visitor in Peking. Three railroads bring their traffic to the gates of the city. The tinkling camel bells of the caravans are no longer heard. They have been replaced by the indefatigable bugling from school parade grounds and camps. The mediæval watch no longer patrols the midnight streets with noise of rattle and drum, for the new police, with their foreign uniforms, rifles, and sentry boxes in every quarter, have consigned it to oblivion. The streets that were once filth-strewn are now well paved and flanked by brick drains. The paper lanterns that accentuated the darkness of former days have been replaced by electric lights. Scavengering is no longer left to pariah dogs and pigs. Broughams and jinrikshas ply in the place of sedan chairs and springless carts. A remarkable indication of the change in social and educational standards is the new zoölogical and botanical garden, whither large crowds of both sexes resort daily. Any one would have been thought crazy who had predicted in 1900 that in less than ten years a foreign adviser to the Chinese Government would be driven in an automobile, in company with a member of the Grand Council, from the city to the Summer Palace; or, that Chinese newspapers, printed in the capital, would freely discuss the necessity for constitutional government. Yet these things and others equally remarkable have come to pass.

THE NEW FLORA OF KRAKATAU.—Recent visitors to Martinique report the rapid growth of vegetation in the region that was buried under the débris from Mont Pelé in the great cataclysm of 1902. Similar reports come from the famous volcano of Krakatau, whose eruption in 1883 destroyed every vestige of plant life on it. An account of the recovering of what was left of the island by vegetation is given in the *Geographical Journal* (Oct., 1908, p. 428). The volcano has afforded an unusually instructive object lesson on the colonization of new land by vegetation. Dr. Treub of the Buitenzorg Botanic Garden, Java, visited the island in 1886 and 1897 and studied the early stages of the re-occupation of

the island by plants. He observed that an unusually important part was being played by the wind as compared with other agencies, in transporting seeds, spores, etc., to the unoccupied surface. Thus, while in the cases of coral and other low-lying islands the shore vegetation has been most rapidly developed, in the case of Krakatau the inland species (particularly ferns), made good their footing just as quickly and in even greater numbers.

Prof. A. Ernst of Zürich visited Krakatau and the neighbouring parts of the Straits of Sunda in April, 1906. His visit and its results are described in the *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich,* Jahrgang 52, Parts 3-4 (Zürich, Fasi u. Beer, 1908). He was struck with the astonishing progress made by vegetation, almost the whole south-east side, from the shore to the summit, being clothed in green. The present flora embraces all sections of the vegetable kingdom and the number of species amounts to 137. The chemical composition of the soil and its physical properties, since the eruption, are not so unfavourable as might be supposed. Apart from nitrates and phosphates, all substances necessary to plant growth are present in the volcanic deposits, while the missing constituents are supplied by winds, waves, rain, etc. Both algæ and bacteria play an important part in preparing the soil for plant-life. Winds, currents, birds, etc., transport plants and their seeds to the island. The important part played by the wind may be explained by the nearness of the island to other lands, which permits the transport by wind of the seeds of such orders as *Gramineae, Cyperaceae,* and *Orchideae,* as well as the spores of ferns. It is not easy to decide on the proportion of the flora brought by each agency, but Prof. Ernst concludes that from 39 to 72 per cent. have been brought by currents, 10 to 19 per cent. by birds, and from 16 to 30 per cent. by the wind. Apart from the number of species, it is surprising how far the differentiation into plant-associations has already progressed.

Latest Achievement of Dr. and Mrs. Workman.—The *Pioneer Mail* of India says that these distinguished American mountaineers, accompanied by Dr. C. Calciati and Dr. M. Koncza, Surveyors, have carried out successfully a detailed survey of the Hispar Glacier in Hunza-Nagar. After remaining five weeks on the Hispar Glacier, camping much of the time on the snow at altitudes varying from 16,000 to 19,000 feet, the party, with guides, and a caravan of Nagar coolies, crossed the Hispar Pass and descended the Biafo Glacier, 30 miles long, reaching Askole, Baltistan, on Aug. 26. The chief objects of the expedition were glacier study and mapping, but several new peaks and snow passes were climbed, the most notable being a very steep and difficult snow peak, about 2,000 feet high, situated some distance to the north of the Hispar Pass on the watershed of the Hispar and Biafo Glaciers, overlooking the solitudes of Snow Lake at the head of the Biafo Glacier. This is the second traverse of these two glaciers, the first having been made by Sir Martin Conway in 1892.

The Survey of India.—In the report of Col. F. B. Long, Surveyor General of India, for the year ending Sept. 30, 1906, he says that the total outturn of detailed topographical and forest surveys on all scales was 23,312 square miles. The publication of the general maps of India has been delayed, partly by administrative changes and later because the symbols regarding the external boundaries of India have not been settled. The new map on a scale of 32 miles to an inch, sanctioned and begun six years ago, was still unpublished when the report closed.

DR. SVEN HEDIN.—After his arrival at Simla, Dr. Hedin delivered a lecture on his discoveries in Tibet in which he said that, although little is left in that country in the way of geographical discovery, much remains to be done in geography. He is of the opinion that from two to three years will be required to work up the mass of scientific information collected by him relating to tracts hitherto unknown to the Western nations. He sailed from Bombay for Yokohama on Oct. 13. He expects to complete the writing of the popular account of his recent Tibetan travels by next May.

POLAR.

RASMUSSEN RETURNS FROM GREENLAND.—Mr. Knud Rasmussen, the ethnologist, returned to Copenhagen in July from his second Greenland journey. He expects to organize an expedition through Arctic America west of Bering Strait for the study of the Eskimo tribes living there. His last journey was preparatory to this larger enterprise. Accompanied by his sister, he travelled in the summer of 1906 through Danish West Greenland and across Melville Bay to the Eskimos living on the east side of Smith Sound, where he again spent a winter with them. In May, 1907, he crossed the northern end of Smith Sound, accompanied by two Eskimos and reached Ellesmere Land at Cape Camperdown. This point is only a short distance north of Cape Sabine where many of the Greely party died of starvation, but Rasmussen was so fortunate as to meet many musk-oxen there and he reports that all conditions are favourable for his proposed undertaking. He remained some weeks in Ellesmere Land and then recrossed Smith Sound and made his way across the ice of Melville Bay to the Danish colonies, where he spent last winter.

THE FRENCH ARCTIC EXPEDITION.—News has been received from the French Arctic expedition, under command of Captain Bénard, that went north in April last to engage in exploration and investigate the possibility of establishing profitable fisheries in Barents Sea (p. 423). Their ship, the *Jacques Cartier,* touched at Hammerfest, crossed Barents Sea and reached Bailutsia Fiord in Novaya Zemlia, where several hitherto unknown fiords were discovered. The expedition shot a goose on July 14, the first fresh food obtained for three months. On July 25, the first sledge expedition left the ship with provisions for twenty days, intending to cross Novaya Zemlia from west to east. It was followed six days later by a second party. The expedition will probably not winter in Barents Sea, but will return to Norway and remain there till spring.

ANTARCTIC METEOROLOGY.—When the results of the four most recent Antarctic expeditions are completed, they will form an Antarctic library of about 30 large quarto volumes. The full official statement of the meteorological results of the National Antarctic expedition in the *Discovery* is now completed and has been published by the Royal Society in a quarto volume of some 550 pages, prepared under the superintendence of the Director of the Meteorological office, Dr. W. N. Shaw. Mr. L. C. Bernacchi, physicist to this expedition, has written a review of the volume in *Symons's Meteorological Magazine* (Oct., 1908), from which the following facts are taken:

The meteorological work at the winter quarters of the *Discovery* (Lat. 77° 50′

50″ S.; Long. 166° 55′ 45″ E.) were continuous from Feb., 1902, to March, 1904, over two years. Observations were made every two hours. The mean temperature from Feb 9, 1902, to Jan. 31, 1904, was —1.7°, the mean for the first year being 0.4° and for the second, —3.0°. The lowest mean temperature for any one month was —21.1° for July, 1903, and the highest mean temperature, 26.1° for January, 1903. The absolute maximum temperature observed was 39.0° in the first year and 42.0° in the second; both during the month of December. The absolute minimum temperature was —50.5° in the first year and —58.5° in the second, the first being in August and the second in September.

The winter quarters were warmer than some others in the locality. Corresponding minimum temperatures at Cape Armitage, in a more exposed position on the barrier surface, were —62° and —64.6°, respectively. The lowest temperature noted was at Cape Armitage, on May 16, 1903, when the spirit minimum indicated —67.7°. Minimum temperatures of —52.0°, —58.5°, —61.2°, and —64.6° were noted on different sledge journeys during the early spring of 1902 and 1903.

Fluctuations of temperature were rapid and violent at all seasons. Increase of temperature, especially during the winter, was associated with a wind from the pole. The range of temperature during the winter months of June, July, and August, 1903, was 64.0°, 66.2°, and 65.0°, respectively. The maximum range for the year, 1903, was 100.5°.

The summers were very cold, only a few days giving a mean temperature above freezing. A low summer temperature is characteristic of the Antarctic regions. The large mass of land ice and the remarkable dryness of the air would seem to be partly responsible for this. There is an abundance of bright sunshine in the summer, the total amount for 1903 being equal to that of Scilly.

The barometer stands higher in that region than in more northern parts of the Antarctic, where observations have been obtained. The common semi-diurnal oscillation is clearly shown, amounting to about 0.002 inch with maxima at about 10 A. M. and 10 P. M. at all seasons of the year. The highest pressure observed was 30.181 inches and the lowest, 28.140 inches. The surface winds at the ship were chiefly easterly, just as they were at Cape Adare and on the German ship *Gauss*. All the observations taken on the sledge journeys clearly indicate that the direction of the prevailing wind at some distance away from the littoral is south-westerly.

EDUCATIONAL.

Professor Penck's Lectures.—Professor Penck of the University of Berlin began his course of lectures in the Peabody Museum of Natural History, Yale University, on Oct. 13. The subject of the 10 lectures was Problems of Glacial Geology: 1, Glaciers and Climate; 2, Glaciers and Water; 3, Glaciers and Moraines; 4, Older Moraines and Glaciers of the Great Ice Age; 5, Climate of the Ice Age; 6, Different Glacial Systems; 7, Interglacial Times; 8, Chronology of the Great Ice Age; 9, Antiquity of Man; 10, Glacial Earth Sculpture.

Professor Pénck began his course of lectures in Columbia University on Nov. 4. The subject of the inaugural lecture was: "The Face of the Earth." He is Kaiser Wilhelm Professor in Columbia University for the year 1908-9.

On the 24th of November Prof. Penck will address the American Geographical Society on The Origin of the Alps.

GEOGRAPHY AT EDINBURGH UNIVERSITY.—Mr. Chisholm's course in Edinburgh University during the coming winter session will embrace about 75 lectures, delivered daily during the session. The syllabus which appears among the courses for graduation in Arts in the University *Calendar* includes lectures under the headings: Scope of Geography, Cartography, Form of the Earth, Distribution of Land and Water, Meteorology and Climatology, Typical Land Forms and their Relation to Rock-Structure, Economic Geography, Political Geography, History of Geographical Ideas, Progress of Discovery, and Elementary Principles of Surveying.

THE BERLIN GEOGRAPHICAL INSTITUTE.—In view of the fact that exceptional opportunities for the study of geography are given by this Institute, the description of it and its work by Grace Meiklejohn (*Scot. Geog. Mag.*, No. 10, 1908) will interest many American geographers. A condensation of the article is presented here.

The geographical work of the Berlin University is carried on chiefly in the Geographical Institute which was founded by Baron von Richthofen in 1887 and now occupies the upper story of the Oceanographic Museum, near the University. The rooms include a lecture hall, map room, workroom, drawing department and library. The lecture hall is well supplied with blackboards, has a wall relief of the Alps on a scale large enough to adapt it for class demonstration, and the hall may instantly be darkened for the use of a lantern.

The collections in the map room are admirable. They include a large number of the topographical and geological survey maps of the various countries, large wall maps, reliefs, instruments, both for field and indoor work, and the morphological collections both of the Institute and Prof. Penck. The atlases are kept in the workroom where there are long tables for laboratory work.

The library contains rather less than 4,000 volumes, in addition to the geographical pamphlets of the late Baron von Richthofen, which have now been added to it. The books are arranged by subjects. One division contains works on oceanography; another, on mathematical geography and so on. The upper part of this floor is devoted to standard works on regional geography, geological survey reports, geographical periodicals, etc. Writing tables are provided for the students, who are enabled to use the library with every comfort.

In the drawing department draughting tables, colours, instruments for enlarging and diminishing maps and everything required for map drawing are provided.

The lectures cover a very wide field. In the winter session of 1907-8 Prof. Penck lectured every day on "Europe," and twice a week on "The Atmosphere." The subject of his daily lecture during the summer session was "Mountains." The subjects of Prof. Grund's lectures during the school year were "Oceanography," "Applied Oceanography" (a continuation of the earlier course), "The Polar Regions" and "The Balkan Peninsula and Asia Minor." Each of these topics was treated in an extended course.

Map drawing and field work are under the charge of Prof. Groll. Map work of all kinds is carried on by students under the direction of a professor. Students may be engaged for many weeks working up some particular region, often one that they have studied on the spot during a spring or summer vacation. Students had an opportunity last summer, during the illness of Prof. Groll, to join Sunday excursions for field surveying under the leadership of an officer in the German Army.

Among the most interesting features of the work are the evening meetings under the guidance of Prof. Penck and Prof. Grund. The younger students meet every Friday evening from 6 to 8. One of their number reads a paper upon such topics as "Coral Islands," "Circulation of Underground Water," "Sand Dunes," "Exploration of Australia" etc. (these topics were among those of 1907-8), and a discussion follows in which professor and students take part. The evening meetings for advanced students are held on Tuesdays and are attended by men who are working for their degree and also by outsiders, such as school teachers, who thus keep in touch with the problems that are now interesting geographers. The papers are usually the outcome of practical, original work done by the students. Lectures at these meetings are also delivered by guests invited by Prof. Penck. Thus, last year, Lieut. Filchner lectured on his work in Tibet and Dr. Frank Leverett on "Glaciation in the United States." After the lecture, there is discussion and the lecturer asks and answers questions. These meetings also last for two hours but the interest in the discussions is often so keen that the time is extended.

The scientific excursions are from one to several days in length. The Whitsuntide excursion last year was a five-days' walking tour in Thuringia and during it valley formation was chiefly studied. Students often carry on practical work in the longer holidays, but this is at their own expense.

The Institute is under the management of Prof. Penck, who is assisted by Dr. Quelle and the custodian, Mr. Baschin. Prof. Penck is also Director of the Oceanographic Museum.

Bibliographies for Teachers.—The Committee of the Association of American Geographers, in charge of work relating to educational map material and geographical reference and text-books, will submit at the Baltimore meeting this winter lists of cartographic and literary material, published in several languages, in the hope that these lists may prove helpful to normal school classes in geography and to teachers; also, a list of the best histories of cartography now available, showing its evolution, its present methods and its efficiency in geographical education.

The American Federation of Teachers of the Mathematical and Natural Sciences has in progress a bibliography for reference in teaching the several sciences which, it is expected, will be completed before January 1, 1909, and published immediately thereafter.

It is announced that Dr. H. R. Mill's small volume containing a selected bibliography of geographical works will soon be issued in a new edition under the auspices of the Geographical Association of Great Britain.

Geography at the British Association.—The Geographical Section at Dublin had excellent accommodations in the Royal Dublin Society's building, on the opening day of the meeting, Sept. 3. Major E. H. Hills read a paper on the Survey of the British Empire, which amounted to a plea for the more thorough organization of the Imperial Survey. One of his most notable recommendations was that the remeasurement of the two principal arcs, meridional and longitudinal, should be undertaken by the British Ordnance Survey. This recommendation was afterwards sent as a resolution to the Council of the Association. Professor W. M. Davis of Harvard gave two brilliant lectures, one on the physiographic subdivisions of the Appalachian Mountain system and the other on the Colorado

Cañon. On Friday large audiences were attracted by papers on geographical education. The gist of Prof. R. A. Gregory's paper on "School Geography as a Mental Discipline" and of the discussion that followed it was that geographical causes and their political, economical or other effects must be taught in an orderly perspective, and it is desirable not merely to present facts and their reasons to the student, but also to train him to deduce reasons from facts for himself. Dr. A. J. Herbertson laid stress on the utility of work in the field and also of instruction in the reading of maps and all the inferences to be drawn from cartographical representation. Prof. J. L. Myres in a paper said that the "classical education," as generally conceived, takes no account of geographical environment, though only the study of that environment can provide a proper background for the picture which it was desired to impress upon the minds of students. Mr. W. L. Grant, in a lecture on the northward expansion of Canada, brought out the idea, new to many of his hearers, that in the development of the Canadian north-west railroad construction must precede instead of following settlement.

On Monday, Sept. 7, Mr. E. A. Reeves exhibited and explained three instruments designed by him for the use of surveyors and travellers; (1) a distance-finder alidade for plane-tabling; (2) an astronomical compass and time-indicator (3) a new form of reflecting artificial horizon. Mr. H. G. Fordham read a paper on "Notes on the Cartography of the Counties of England and Wales," in which he brought out the fact that the plates of some maps still issued for travellers are about a century old, though, of course, brought up to date. Captain H. G. Lyons, of the Egyptian Survey, read a paper on the longitudinal section of the Nile, showing that an almost complete line of levelling exists along the river from Victoria Nyanza to the Mediterranean, 3,500 miles. The slope of the main river, after it debouches from the elevated equatorial plateau upon the level plain of the Sudan, is only 3 inches, or a little more, to the mile. The flattest part of the whole course is between the Sobat and Khartum, where the slope is from one-half to one-third of an inch to a mile. On Tuesday, the Rev. George Furlong read a paper, entitled "Unique Experiences at the Birth of a Volcano." He was a missionary in Savaii, Samoa, when the volcano of O Le Mauga Mu broke into life and he observed and photographed, often under great difficulties, the phenomena accompanying the outbreak and the opening and building up of the crater. Some of his photographs were highly impressive, especially those of the eruption of steam where the hot lava flow reached the sea. Among the other contributors to the programme were Dr. W. S. Bruce, who gave an account of his survey and other scientific work on the island of Prince Charles Foreland in the Spitzbergen group, and Mr. L. C. Bernacchi, well known for his Antarctic work in the *Discovery* expedition, who gave an account of his journey in the little explored Rio Inambari region of Peru, where a new field for the rubber trade is opening up.

VARIOUS.

Ice and Its Natural History.—The Society has received from Mr. John Y. Buchanan a copy of the paper which he read before the Royal Institution of Great Britain on May 8 last on those points in the natural history of ice which he has made the subject of special investigation. On experimental evidence he has established the fact that, when a non-saturated saline solution is gradually frozen the ice crystals separate out and are pure ice and that the salt from which they

cannot be freed belongs to the adhering brine; also, that when water which holds salt in solution freezes at a temperature below o° C., the salt forms no part of the ice produced; but it is the cause of lowering the freezing-point, for, if it is removed, the freezing-point reverts to the normal.

After treating of various phases of the physical nature of ice, such as the granular constitution of glacier ice, the size of glacier grains, etc., the author describes the scoring and grooving of glacier ice by opposing rocks and then gives nearly half of the monograph to a discussion of the external work of a glacier. In its physiographic relations, he finds that ice is as efficient a preserver of mineral matter as it is of vegetable or animal matter in the every-day relations of life. He also finds that the substance which chemists indicate by the symbol H_2O has the most destructive action on mineral matter when it has passed from the gaseous state in the atmosphere to the liquid state on the surface of the earth and when this takes place in regions where the atmospheric temperature is high. Chemical decomposition accompanied by disintegration is the result and it is followed by degradation under the all-pervading influence of gravity. This chemical and gravitational degradation is the primary process in the wasting of land substance:

> Owing to the enormous diminution in the amount of land ice in the course of the last half century we are accustomed to talk of the retreat of the glaciers. But a glacier never retreats; it stops advancing and melts where it stands. Even in a stationary glacier, however, the flow of the ice in all its parts continues; but its effect outside of the glacier is almost, if not quite, *nil*. In the stationary stage, its function in nature is conservation. In the advancing stage, it adds the function of distribution. Its destructive effect is very small. It protects the rock beneath it from weathering, which is a chemical process, by the constant maintenance of a low temperature and the practical exclusion of the atmosphere. Any destructive action which it exerts must therefore be mechanical.

Mr. Buchanan is not one of the geologists who believe in the great erosive power of glaciers. In his opinion they are responsible only for clearing the débris out of the valleys and distributing it over the plain. The production of the débris itself may be attributed to the warm inter-glacial periods and the existence of the débris, he thinks, furnishes the best evidence of the reality of a previous warm period.

Relation of Radium to Geology.—The Vice-Presidential address by Prof. John Joly before the section of Geology at the recent meeting of the British Association for the Advancement of Science (printed in *Nature*, Sept. 10, 1908) is an important and carefully prepared discussion of the relation of uranium and radium to geology. The wide distribution of radium in ocean deposits and in the rocks of the earth's crust is shown to have a probable bearing on some of the fundamental problems of geophysics, notably the question of the rate of cooling of the earth and estimates of its age, and the question of the formation of mountains and continents. Prof. Joly does not attempt to overturn geological theories, but finds support of these in the consideration of the probable effects of radio-thermal cooling. For instance, he says:

> Radium has occasioned no questioning of the older view that the cooling of the earth from a *consistentior status* has been mainly controlled by radiation. But, on the contrary, this new revelation of science has come to smooth over what difficulties attended the reconciliation of physical and geological evidence on the Kelvin hypothesis. It shows us how the advent of the present thermal state might be delayed, and geological time lengthened, so that Kelvin's forty or fifty million years might be reconciled with the hundred million years which some of us hold to be the reading of the records of denudation.

One of the most interesting parts of Prof. Joly's address, from the standpoint

of the physiographer, is that which deals with mountain formation. It has long been known that mountain uplifts follow long-continued periods of depression, great geosynclines being transformed to geanticlines. Many attempts have been made to account for this fact, but there is a general feeling that none of these attempts has been wholly satisfactory. Prof. Joly ingeniously introduces radio-thermal activity and puts forward a theory that has great plausibility, though it must be admitted that our knowledge of radium is as yet too imperfect to warrant an attempt at final conclusion. He shows that there is a zone of radium enrichment in surface deposits, and, upon this, the old crust, the deposits of the geosynclines accumulate. Now, since the rise of temperature through radio-thermal heating is proportional to the square of the thickness of the deposit, the heating of the lower layers finally causes a weakening of the crust along the line of the geosyncline. To quote Prof. Joly's words:

> Over the area of sedimentation, and more especially along the deepest line of synclinal depression, the crust of the globe, for a period, assumes the properties belonging to an earlier age, yielding up some of the rigidity which was the slow inheritance of secular cooling. Along this area of weakness —from its mode of formation generally much elongated in form—the stressed crust for many hundreds, perhaps thousands, of miles finds relief, and flexure takes place in the only possible direction; that is, on the whole, upwards.

Prof. Joly does not attempt to supplant contraction as the motive cause for mountain formation, but merely to supplement it.

He also attempts to apply his theory to the formation of mountains in the ocean and to account for the former presence of continental lands now submerged Here his argument is somewhat less convincing, though ingenious and interesting. On the whole, this is a noteworthy contribution to the interpretation of earth history, and probably one of the forerunners of a long series of papers dealing with this new element in the problems of the present condition and past changes of the earth. R. S. T.

Glacial Erosion.—Mr. E. C. Andrews has contributed several valuable papers on the subject of glacial erosion, especially with reference to conditions in New Zealand. His latest paper (Proc. Linnean Society of New South Wales, 1907, Vol. XXXII, pp. 795-834) is especially noteworthy for its statement of the flood hypothesis of glacial erosion. Mr. Andrews shows the characteristics of stream valleys produced under flood conditions and points out resemblances between such valleys and those caused by ice action. He calls attention to Gilbert's statement that both stream valleys and coast lines are adjusted to the needs of the flood stage, rather than the draught stage, and then applies Gilbert's principle to an interpretation of valley forms due to ice erosion. His conclusion is that glaciers erode mainly in flood stage, whereas during the stagnant stage their erosive action is relatively ineffective, as in the case of rivers. During the Glacial Period glaciers were in flood in many parts of the world; and then they were effective agents of erosion. Now they are in the drought stage and in most places are capable of little work of erosion. Most students of glacial erosion will accept this principle, which is so clearly and forcibly enunciated by Mr. Andrews. His paper is a distinct contribution to the literature of glacial erosion, not merely for the statement of this principle, but also for the details and comparative studies which it presents. R. S. T.

Periods of Ancient Glaciation.—The Pleistocene ice age, for a long time seemed a strange and almost impossible phenomenon; but it has long since become

a commonplace, although we are yet unable satisfactorily to account for it. Some broad-minded scientists long ago hinted at probable earlier ice ages. Students of the late Professor Shaler now vividly recall his marshalling evidence, as much as fifteen or twenty years ago, to support this contention that there had been earlier periods of glaciation. Few of his students, devoted though they were to him and convinced of his genius, were quite able to grasp this conception. Now, however, every one is convinced of Permian glaciation in South Africa and elsewhere, just as he taught. It is peculiarly appropriate that the first research of the Shaler Memorial Fund should be to study the evidence of supposed Permian glaciation in Brazil.

We are now quite familiar with this period of glaciation, but less so with a still earlier one of which evidence is accumulating. Willis has brought forward facts which convince most students of glacial action of the presence of extensive continental glaciation in China prior to the Cambrian; and more recently (see especially his latest paper, *Journal of Geology*, Vol. XVI, 1908, pp. 149-158) Prof. Coleman has presented striking evidence of a "Lower Huronian Ice Age" in Canada, possibly contemporaneous with that of China. In a conglomerate from the silver-mining region of Cobalt he has found striated pebbles which have every appearance of being glacial in origin. The pebbles and boulders are in a matrix resembling till, and the whole rock is classed by Coleman as a "tillite," using the name applied to the South African glacial deposits. Tillite is a consolidated till or boulder clay, in this instance in placer metamorphosed to schist, and covering a wide area. While the evidence is not so convincing as that from South Africa, it is sufficiently strong to satisfy most students of the subject.

These ancient ice ages in various parts of the world now having temperate or even tropical climate, and at various periods of the earth's history, are almost startling. They are liable to have a wide-reaching influence on our conception of the earth as a habitable globe. Indeed, Coleman already suggests that we "should cease to speak of the earth as once a molten globe." Whatever the ultimate conclusion may be it certainly will be one in which we must needs explain phenomena that are utterly impossible in the present earth condition. R. S. T.

The latest "Beiheft" to the *Tropenpflanzer* (Vol. 9, No. 5) is a monograph on "Der Ixtle und seine Stammpflanzen" by Dr. Rud. Endlich, treating of henequen and its related fibres.

The United States Geographic Board has just issued in a pamphlet of 38 pages all its decisions from July, 1906, to July, 1908, including the names of the municipalities and barrios of Cuba, adopted by the Cuban Government and tentatively approved by the Government.

Dr. H. R. Mill announces in "British Rainfall in 1907" that after next January he intends to devote his whole strength to the study of rainfall. He has therefore resigned from many committees and has reluctantly given up his position as one of the British representatives to the International Council for the Study of the Sea, as he feels that it is no longer possible to keep pace with the rapidly expanding science of oceanography without encroaching upon the more pressing claims upon him.

The Royal Scottish Geographical Society has moved into new quarters at Synod Hall, Castle Terrace, Edinburgh, which provide much larger accommodation

than the old rooms. There is a large area of wall space for the display of maps and pictures.

Mr. E. G. Ravenstein, the well-known British geographer, and Mrs. Ravenstein, celebrated the fiftieth anniversary of their wedding on Sept. 7 last and in connection with the event Mr. Ravenstein printed, for private circulation, a list of the most important maps, books and papers drawn, compiled or written by him from 1853 to the present time. The list fills 47 pages and bears witness to the great industry of this able geographer.

Cape Colony, following the example of this country, has undertaken to make a survey of the agricultural soils of the colony. The detailed results with black-and-white sketch maps are being printed, as the survey progresses, in the *Agricultural Journal* of the Cape of Good Hope.

Mr. G. T. Surface of the Central High School, Philadelphia, has been appointed Instructor in Geography at the Sheffield Scientific School, Yale University.

The *Journal of Geography* announces the formation of a Geographical Society in Cleveland, O., with a membership of over 260. Mr. W. M. Gregory of the Central High School was largely concerned in organizing it. Miss Bertha A. Brown of 7409 Linwood Ave., Cleveland, is Secretary of the Society.

Mr. R. H. Whitbeck of the Trenton (N. J.) State Model School is preparing a bibliography on the teaching of geography and geology.

NEW MAPS.

AFRICA.

EGYPT.—Egypt. Scale, 1:50,000, or 0.7 statute mile to an inch. Sheets: III-II N. E.; III-I, III-II, III-III S. W.; IV-I, IV-II S. E; IV-I, IV-II, IV-III S. W.; V-I S. E.; V-I, V-II S. W.; VI-I S. E.; VI-I and VI-II S. W.; VII-I, VII-II S. W.; VIII-I, VIII-II S. W. Survey Department, Cairo, Egypt, 1908. (Price 50 mills.)

A prominent feature of this map is the clearness with which roads, paths, and double or single and light railroads are shown. Canals and drains, with few exceptions, have bridle paths on both banks. The sheets are produced in three colours, black, blue and brown, the names being in Arabic, though the greater number of them are also printed in English. The map is chiefly designed for administrative purposes and is made by reducing the cadastral maps (1:10,000) to 1:25,000 and then reproducing them on the scale of 1:50,000.

AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

The U. S. Geological Survey has sent to the Society from Washington the following folios of the Geologic Atlas of the United States:

151—Roan Mountain Folio (Tenn.—N. C.). 36° and 36° 30′ N.; 82° and

82° 30′ W. Descriptive text by Arthur Keith. Topographic, areal geology, and economic geology maps, structure section and two illustration sheets. 1907.

152—Patuxent Folio (Md.—Dist. of Col.). 38° 30′ and 39° N.; 76° 30′ and 77° W. Descriptive text by George B. Shattuck, Benjamin L. Miller, and Arthur Bibbins. Prepared under the supervision of W. B. Clark, geologist in charge; topographic, areal geology, and artesian water maps, and columnar section sheet. 1907.

153—Ouray Folio (Col.). 38° and 38° 15′ N.; 107° 30′ and 107° 45′ W. Descriptive text by Whitman Cross, Ernest Howe, and J. D. Irving. Columnar section, topographic, areal geology, and economic geology maps, structure section and illustration sheets. 1907.

154—Winslow Folio (Ark.—Ind. Ter.). 35° 30′ and 36° N.; 94° and 94° 30′ W. Descriptive text by A. H. Purdue. Topographic and areal geology maps, and columnar section sheet. 1907.

155—Ann Arbor Folio (Mich.). 42° and 42° 30′ N.; 83° 30′ and 84° W. Descriptive text by I. C. Russell and Frank Leverett. Topographic, areal geology, and artesian water maps. 1908.

156—Elk Point Folio (S. Dakota—Neb.—Iowa). 42° 30′ and 43° N.; 96° 30′ and 97° W. Descriptive text by J. E. Todd. Topographic, areal geology, and artesian water maps. 1908.

157—Passaic Folio (N. Jersey—N. Y.). 40° 30′ and 41° N.; 74° and 74° 30′ W. Descriptive text by N. H. Darton, W. S. Bayley, R. D. Salisbury, and H. B. Kümmel. Topographic, areal geology, superficial geology maps, structure section and illustration sheets. 1908.

158—Rockland Folio (Me.). 44° and 44° 15′ N.; 69° and 69° 15′ W. Descriptive text by Edson S. Bastin. Topographic, superficial geology, areal geology, and economic geology maps, and structure section sheet. 1908.

159—Independence Folio (Kan.). 37° and 37° 30′ N.; 95° 30′ and 96° W. Descriptive text by F. C. Schrader. Topographic, areal, structure and economic geology maps, and columnar section sheet. 1908.

UNITED STATES.—Artesian Areas and Ground-Water Levels in the San Joaquin Valley, Cal. Compiled by W. C. Mendenhall. Scale, 12 statute miles to an inch. Water Supply Paper 222, U. S. Geological Survey, Washington, 1908.

The artesian area in which flowing wells may be obtained is outlined and beyond the limits of this area the ground-water plane is indicated by hydrographic contours.

UNITED STATES.—Geologic Reconnaissance Map of Part of the Ketchikan Mining District, Alaska. Scale, 1:250,000, or 3.95 statute miles to an inch. By F. E. and C. W. Wright. U. S. Geol. Survey *Bull.* 347, Plates 2 and 3, Washington, 1907.

These two maps are contoured sheets of the mainland part of the district. The contouring has been taken from the maps of the Canadian Boundary Commission. The contour interval is 250 feet, each 1,000-foot contour being emphasized by a heavier line.

UNITED STATES.—Geologic Reconnaissance Map of the Ketchikan and Wrangell Mining Districts, Southeastern Alaska. Scale about 10 statute miles to an inch. Plate 1, *Bull.* 347, U. S. Geological Survey, Washington, 1908.

Compiled from the Charts of the Coast and Geodetic Survey supplemented by

sketch maps made by the writers. The geology is represented and also the location of the mines and prospects.

UNITED STATES.—Geologic Map of Arkansas. Scale, 24 statute miles to an inch. Supplements "The Clays of Arkansas," by Prof. J. C. Branner, *Bull.* 351, U. S. Geol. Survey, Washington, 1907.

UNITED STATES.—Illinois. Map showing Areas underlain by various Coal Beds. Illinois State Geol. Sur. *Bull.* No. 3, Urbana, 1906.

UNITED STATES.—Illinois. Outline Map of the Upper and Lower Coal Measures. Illinois State Geol. Sur. *Bull.* No. 3, Urbana, 1906.

UNITED STATES.—Illinois. Map Illustrating the Water Resources of the East St. Louis District. Scale, 2 statute miles to an inch. By Isaiah Bowman and Chester A. Reeds. *Bull.* No. 5, Illinois State Geol. Sur., Urbana, 1907.

Shows topography, drainage, culture, and well locations.

UNITED STATES.—A Provisional Geologic Map of Illinois. Scale, 12 statute miles to an inch. (In pocket.) *Bull.* No. 6, Illinois State Geol. Sur., Urbana, 1907.

The *Bulletin* is devoted to a description of the map, the geological data of which are shown in colours. As practically the entire State is mantled with drift and associated deposits, the geological boundaries may be considerably out of place, except in areas where detailed surveys have been made. The coal-mine locations are taken from the Peabody Atlas.

U. S. HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Pacific Ocean, November, 1908.

CANADA.—Geological Map of Parts of Nanaimo and New Westminster Mining Divisions, British Columbia. Scale, 1:253,440, or 4 statute miles to an inch. 122° 45′ — 125° W. Long.; 49° — 50° 20′ N. Lat. Geological Survey of Canada, Department of Mines, Ottawa, 1906.

Illustrates a Report by O. E. Leroy, and shows in colours the geological formation and the topography along this portion of the British Columbia coast and the adjacent islands.

CANADA.—Geological Map of Princeton Coal Basin and Copper Mountain Mining Camp, Yale District, B. C. Scale, 40 chains to an inch. Geological Survey of Canada, Department of Mines, Ottawa, 1908.

Supplements a preliminary report on a part of the Similkameen District. The map covers an area of about 3,500 square miles, is contoured with 100 feet interval and coloured geologically.

CANADA.—Geological and Topographical Map of a Portion of Conrad and White Horse Mining Districts, Yukon Territory. Scale, 2 statute miles to an inch. Geological Survey of Canada, Department of Mines, Ottawa, 1908.

Supplements a Report by D. D. Cairnes on this mining region. The map is based on triangulation, contour interval is 250 feet, colours show the distribution of geological formations, and mining claims, coal seams, etc., are located and named.

CANADA.—Geological Map of Lake Megantic and Vicinity, Quebec. Scale, 2 miles to an inch. Geological Survey of Canada, Department of Mines, Ottawa, 1908.

Illustrates a report by John A. Dresser on the recent discovery of gold in this

district. The rock formations are in colours and the position of the three gold-bearing dikes thus far discovered is shown.

CANADA.—Geological and Topographical Map of a Portion of Conrad and White Horse Mining Districts, Yukon Territory. Scale, 2 statute miles to an inch. Supplements report by D. D. Cairnes, Department of Mines, Canada, 1908.

The map locates the mining claims and probably indicates the different geological horizons accurately enough for the present needs of the district. Towards the north outcrops are scarce and it was difficult to assign exact geological boundaries.

SOUTH AMERICA.—Commercial Map of South America. Scale, 1:10,000,000, or 157.8 statute miles to an inch. By J. G. Bartholomew. Revised by John Samson of the *South American Journal*. With insets of Valparaiso, Lima, Buenos Aires, Montevideo, Rio de Janeiro, Isthmus of Panama, and Trinidad. The Edinburgh Geographical Institute, Edinburgh, 1908. (Price, 2s.)

Shows the entire railroad system, including lines that are being constructed, the extent of navigation on each river, and whether adapted for large or only for small boats, and the steamship routes, differentiating British from other lines. The map is up to date and is an excellent specimen of cartography.

ASIA.

CHINA.—Chart of the West River from Wuchow to Nanning. Scale, approximately, 10 miles to an inch. Statistical Series, 1907, Vol. 4; Southern Coast Ports. Imperial Maritime Customs, China, Shanghai, 1908.

An inset gives the distances from one river port to another.

CENTRAL ASIA.—Himalayan Area Drained by the Brahmaputra. Scale, 43 statute miles to an inch. Geological Survey of India, Calcutta, 1907.

Illustrates "A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet," by Col. S. G. Burrard and H. H. Hayden; Part 3, "The Rivers of the Himalaya and Tibet." The water partings on the north and south of the Brahmaputra basin are shown. The relation of this drainage area to the main Himalaya range is indicated, hydrography is in blue, and unexplored parts of waterways are in broken lines.

JAPAN.—Sheets of the Topographic Survey: Aomori, Hitoyoshi, Kamiagata, Sendai, Shimoagata, Suonada, Wajima. Scale, 1:200,000, or 3.1 statute miles to an inch. Contour interval, 40 meters. Geological Survey of Japan, Tokio, 1907 and 1908.

With a scale so small, in the mountainous regions, the contours are very close together, in spite of the large vertical interval. Figures of elevation are given only for the more conspicuous summits, and without these figures and the sea line it would be difficult to read the contours at all. These fine maps would be much improved if the values of contours at regular intervals were indicated. A large amount of economic and other information is given. The 10- and 20-fathom lines are drawn along the coasts.

EUROPE.

NORWAY.—Topografisk Kart over Kongeriget Norge. Hvaler 10 A. Scale,

1:100,000, or 1.5 statute miles to an inch. 0° 7′ — 0° 54′ E. Long. from Christiania; 58° 20′ — 59° 50′ N. Lat. Norwegian Geographical Institute, Christiania, 1908. (Price, 0.60 kr. a sheet.)

OCEANIA.

NEW GUINEA.—West-Neu-Guinea. Scale, 1:1,333,000, or 21 statute miles to an inch. *Jahresbericht* d. Geog.-Ethnogr. Gesells. in Zürich pro 1907-1908, Zürich, 1908.

The map shows the western part of Dutch New Guinea, south of McClure Gulf and west of Geelvink Bay. It illustrates a paper, "Reisen in Nordwest-Neu-Guinea," by Dr. H. Hirschi. The region is coloured to show hills and flatlands and mountainous areas and the sailing and steamer routes followed by the expedition. New place names are given and the line of faulting west of Geelvink Bay is indicated.

GENERAL.

L'ANNEE CARTOGRAPHIQUE. Supplément annuel à toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Dix-huitième Année. Hachette & Cie., Paris, 1908. (Price, 3 fr.)

Contains three double sheets of coloured maps with explanatory text on the reverse, relating to political and geographical changes, chiefly in 1907. The maps are:

Asia—The Frontier of Cambodia; Railroads in Turkish Asia; Frontier of Luang-Prapang; Expedition to Khatanga (Siberia); Hypsometrical Map of Asia Minor on a scale of 1:5,000,000, based upon the Richard Kiepert map in 24 sheets.

Africa—The Southern Sahara; Western Regions of the French Congo; The New Boundary of Liberia; Territories of the South (administrative reorganization in the Sahara south of Algeria and Tunis); Morocco (itineraries of Mr. Louis Gentil; the High Atlas and Siroua Massif (Morocco), after Gentil's surveys in 1905.

America—Eastern Bolivia (showing boundary regions between Bolivia and Brazil); Frontier between Colombia and Brazil (as fixed by treaty on April 24, 1907); Exploration of the Western Half of São Paulo (from the Reports of the São Paulo Geographical and Geological Commission); and Eastern Peru (based upon recent Peruvian explorations).

WORLD.—Deutsche Übersee-Banken. (Mercator Projection.) *Deutsche Erde*, Vol. 7, No. 4, Justus Perthes, Gotha, 1908.

Shows the distribution of German banks in all parts of the world. Australia is the only continent without a German bank or branch.

BOOK NOTICES.

Contributions to South-American Archæology. The George G. Heye Expedition. The Antiquities of Manabi, Ecuador. A Preliminary Report. By Marshall H. Saville, Loubat Professor of American Archæology, Columbia University. New York, 1907.

The Archæology of Ecuador is or has been up to now quite a virgin field. Hence this book, notwithstanding its limited text, becomes a very valuable contribution from its 55 handsome photographic plates of Ecuadorian antiquities and deserves the credit of being the first serious contribution to the subject. The text embodies a glance at the geographical conditions of the Ecuadorian coast, with special reference to the province of Manabi; a glimpse of the ethnography of Colombia and Ecuador; a meagre historical sketch; 67 pages of a descriptive catalogue of plates and 15 pages of bibliography and some abstracts from older documents in print, but not all of easy access. These abstracts also contain some geographical information. The book is the first of a series which the Heye expedition intends to publish, and we look forward with interest to the realization of this meritorious project. A. F. B.

Die territoriale Entwicklung der europäischen Kolonien. Mit einem kolonialgeschichtlichen Atlas von 12 Karten und 40 Kärtchen im Text. Von Prof. Dr. Alexander Supan. Gotha, Justus Perthes. 1906.

As a by-product of his many years' work on the Population of the Earth, Professor Supan has given us in this book an account of the progress of colonization from the earliest beginnings to its extension over the whole earth. On twelve charts are outlined the rise and decadence of the great colonial powers of the world, and the accompanying text describes in seven chapters (1) the earliest beginnings of transoceanic colonization, (2) the Spanish-Portuguese period, (3) the Dutch period, (4) the Franco-British period, (5) the British-American period, (6) the European-American period, and (7) the principal results of colonization. The presentation of the enormous subject is admirably planned and executed. Whether we wish to look up the colonial history of a given nation or a given territory, we find an unbroken chain of record from beginning to end. Yet the book would not be the work of a geographer if it were nothing more than a compilation of historical data. Its greater merit lies in the fact that this volume of reference is, at the same time, a scientific treatise on the working of geographical laws in the historical development of colonies.

The history of colonization, according to Professor Supan, is the history of the spread of European civilization over the globe. The colonies of the Phœnicians, the Greeks, the Romans, as well as those of the medieval nations, carried the respective civilizations of those peoples to their new homes, thus constantly widening the territory of European, or Mediterranean, civilization. But the movement remained limited to the land-locked seas until Columbus found the way across the ocean. The year 1492 marks, therefore, a turning-point in the history of colonization, or the beginning of colonization as we understand the term to-day.

At the time of Columbus, five centres of high civilization were in existence: one each in Europe, in India, in China, in Central America, and in the Andes of South America. The last two stood apart from the others, which, thanks to their common location on the Eastern continent, had a limited though regular intercourse by way of the great trade routes of the Orient. The occupation by the Caliphate of the nearer East raised a barrier between Europe and Asia, and the attempts to get around this barrier brought Europe in contact with the countries and civilizations of the Western hemisphere. It was not a fortunate accident in history which made Spain and Portugal the pioneers in this movement. Spain, just returning from her victorious wars with the Moors, sent to the New World all the elements set free by the cessation of those wars; these elements represented a combination of greed and pseudo-religious zeal stirred to the highest pitch of fanaticism during years of strife with the unbelievers, a combination which has at all times and in all places been hostile to civilization; and in dealing with the problems arising from the conflict of two different civilizations, the Spaniards proved more than incompetent. What was different from their accepted standards was necessarily not a civilization to them; all they could do was to destroy what they found in order to superimpose their own institutions and to fill their pockets. What made matters worse was that the methods of Spain set the example, for ages, for all the other nations who appeared on the scene, so that colonization meant destruction of the natives and their institutions, and unscrupulous appropriation of their lands and treasures, until almost the end of the nineteenth century. Finally, the exclusive devotion of Spain and Portugal to the conquest of America led these two powers to abandon completely the much more urgent task which lay at their very doors, and for which they, by reason of their geographical location and historical experiences, would have been better fitted than any other nation in Europe: the opening up of northern Africa. If to-day Northwest Africa is mentally more remote from Europe than America, this is due to the misdirected colonial policy of Spain in the sixteenth century.

Pope Alexander's line of demarcation between the Spanish and Portuguese claims established a new principle in political geography. It was the first time that a mathematical boundary was drawn regardless of actual ownership. Until then boundaries had been laid out and readjusted only in countries with comparatively dense population and settlement, by the consent of the powers on either side of the line whose varying rights and claims determined the location of the boundaries. Only in dividing the unknown is it possible to draw straight lines; they express, not only ignorance, but absolute disregard of all existing geographical or political conditions: such as was the attitude of Spain and Portugal toward the newly discovered countries, and has been since that of all colonial powers toward the natives under their control. A straight line on the map says as plainly as a date would, that that country was not settled by the white man until after 1492, and that outsiders, not natives, drew the line. Even the political map of the United States shows the difference between the lines drawn theoretically on the map and those that were established through the process of the growth of settlement.

In the long run, this very policy of exclusion, from their supposed spheres of interest, of all other nations by Spain and Portugal, stirred the others to seek new thoroughfares which they might monopolize in their turn, so that at the bottom it was the Iberian countries themselves who forced the Western nations to compete

with them as explorers and colonizers. Even Francis the First of France had protested against the papal division of the New World; in 1580, Queen Elizabeth declared that only the actual occupation of a country gave the right of ownership, and Grotius of Holland upheld, in 1609, the principle of the *mare liberum* against the policy of exclusion. It was his country, too, that drove the first wedge into Spanish supremacy when, in the treaty of 1648, Spain was obliged to recognize the Dutch conquests on her former possessions, a recognition which implied that the papal line had lost its signification.

The Franco-British period enlarged the territory under colonial government by the addition of the lands of North America. The struggle for supremacy between the two powers was decided when France, led on by her continental location, tried to pursue at once European and colonial interests, while England's insular location prevented her from making this mistake. During this period, the fate of the North American colonies is an almost minute reflection of the ups and downs of European state controversies until, at the close of the Seven-Years' War, the treaty of 1763 marks the passing of French supremacy to England, both in America and India. The rebellion of the American colonies made India the foremost object of English solicitude on colonial ground, and thus, together with the addition of Australia and New Zealand, the point of gravitation of the English colonial empire migrated definitely to the Eastern hemisphere.

The appearance of the last of the great colonizers, Russia, on the boundless plains of Northern Asia, and her rapid advance to the coast of the Pacific Ocean, created the youngest of colonial rivalries, the Anglo-Russian conflicts in Central Asia. The end of the nineteenth century sees the colonization, *i. e.*, Europeanization, of the world almost completed by the dividing up of the Pacific Ocean and of Africa among the nations which represent most perfectly the ideas of civilized Europe. Contrary to preceding periods, however, few of the controversies lead to the clashing of arms; the age of treaties has supplanted that of wars, and the creation of spheres of interest begins to be considered more desirable than political aggrandizement. The few habitable spots on the globe which have withstood the tide of colonization so far will, therefore, probably withstand it indefinitely. This is most deplorable in the cases of Morocco and nearer Asia, because a better development of the natural resources of these countries is heartily to be desired on general economic principles. In the Farther East, Japan has assumed the rôle of a mediator between Eastern and Western ways, so that the modest beginnings of European penetration at the outskirts of the old nations of the Farther East will probably never develop beyond this initial stage.

Among the results of the colonial movement, the large migrations of the nations which it has involved must be mentioned first. Hundreds and thousands of the white, the black, and the yellow races have in the course of this expansion left their old homes for new ones, and this means the enlargement of the area fit for the habitation of man not only by the addition of square miles, but by developing the possibilities of those areas. The extermination of the native races cannot be attributed to the sins of the colonists exclusively, because, wherever the natives were morally and physically strong nations, they have survived the first barbarous onslaught. Often the arrival of the whites and the contact with the new civilization have only hastened a process of decadence that had begun long before that time. It must be remembered, moreover, that cruelty and vice cannot be made a special attribute of colonization; for, at the same time when Cortés slaught-

ered the Mexicans, Torquemada offered to the Lord his holocausts of heretics. It was the spirit of the time, not of the colonial movement, that brought forth these atrocities. Much more justified is the criticism that is made of the impoverishment of the new lands by wasteful methods of exploitation. In this respect the colonists did, indeed, on colonial soil, what they would never have dared to do in the old countries. But this is only the first stage of the process. The United States offer the best example that sooner or later nations of colonial origin wake up to the necessity of rational management of natural resources. As soon as this necessity is clearly understood, the colonist will be able, by his superior knowledge, to develop his new country better than the native could ever have done. Then, indeed, and then alone, he vindicates his right to the soil as superior to that of the native. He who succeeds in developing the treasures of a country to their highest efficiency is that country's rightful master. It is because the Indians did nothing to make themselves masters of the soil in this respect that they lost it.

The policy of the conqueror against the native, too, has changed in the course of time. The early colonists were guided by two different policies: the economic (as they understood it) and the humanitarian. The former prevailed throughout the stage of conquest; it meant the driving away, killing, or enslaving of the natives; the Catholic Church alone applied the latter. But in modern times it has been understood that a humanitarian policy is, in the long run, also the more advantageous from the economic point of view. This change is especially to be welcomed with regard to those countries where the colonist deals, not with primitive peoples, but with other civilizations; where his task is not the raising of an inferior race but rather an exchange between two different civilizations. At the time of the conquest of America, all that the conquerors could do was to destroy the native civilizations; but the conquest of India, three centuries later, enriched Europe by the treasures of literature, art, and philosophy of the conquered country. So it will be with Japan and with China. While Europeanism is advancing with large strides toward the supremacy of the whole earth, the civilizations of the Old World will never be so entirely carried away by it as were those of America. The final result of the contact of the different civilizations in modern times will be found rather in the working out, not of one uniform universal civilization, but of common foundations for the different civilizations, the destruction of the mental barriers that separate their adherents, and a better understanding of the one for the other. Then, and then only, will it be possible for any country to pursue world politics in the true meaning of the word. M. K. G.

Mittelmeerbilder. Gesammelte Abhandlungen zur Kunde der Mittelmeerländer von Dr. Theobald Fischer. Neue Folge mit 8 Kärtchen. Leipzig und Berlin, Druck und Verlag von B. G. Teubner, 1908.

This edition of Professor Fischer's *Mittelmeerbilder*, following in less than two years his first edition, includes certain additional studies of a scientific character. The work, in the main, is composed of lectures which the professor, on various occasions, has given before public audiences. For so long a period has Professor Fischer carried on his studies in Mediterranean, and particularly in Italian, geography that his word is an authority seldom to be questioned.

Section I treats in particular of the historical significance of the Mediterranean region and how its peculiar geographical conditions have contributed as factors in the cultural evolution of the border nations. In the following four sections

we are carried through an interesting study of the coasts and their changes, through the geomorphology of Italy, through a very special but interestingly presented study of the orography of the Iberian Peninsula, through a study of the climate of the Mediterranean lands with a particular reference to that of Morocco. The concluding section will appeal to the majority of readers as the most interesting and most significant. As northwestern Africa holds a place so prominent in European International Politics, the consideration of Morocco as a field for military operations is, what we might call, timely, as is also the concluding chapter on the peoples of the Mediterranean region and their significance in world politics. This part of the work, we are told in a note, is to appear in a Smithsonian Report to Congress in 1907. E. L. S.

From Pekin to Sikkim through the Ordos, the Gobi Desert, and Tibet. By Count de Lesdain. With Maps and Illustrations. New York, E. P. Dutton and Company, 1908.

We are told in the Preface of this work that the journey was a wedding tour "undertaken to gratify our wish to cross country hitherto unknown, and if possible to increase the geographical knowledge of the day." The Count must have felt gratified at the close of his journey, for new country was explored and our geographical knowledge is richer because of his travels.

It is seldom that one takes up a book of travel so entertainingly written as is this one. The style is pleasing and the author exhibits a good sense of proportion, for of scenes and events he seems to record that which the reader wishes to know. He appears to have been alert to those things which touch vitally the interests of the people whose country he visited. In his comments on the manners and customs of the people, the official and the unofficial classes, he notes a widespread conservatism, but he interestingly refers to the possibilities and the probabilities of improvement.

One of the first matters of interest mentioned by the Count is a record of his visit to the tomb of the great Mongol Emperor Jenghis Khan at Edchen Koro, which tomb he describes. To write that "no other European has hitherto been able to discover its actual site, much less to see it," must be regarded as erroneous (*vide* Yule's Marco Polo, Third Edition, Vol. I, pp. 249-250). After all is said, this spot must still be regarded as the traditional site. M. de Lesdain makes an occasional reference to the missionaries, who have found their way into this little known Mongol land (pp. 48, 58, 100), which is of importance. The Count is not severely critical of their conduct, but one can read in his lines a story very briefly told, explaining in part the Boxer uprisings. The author does not appear hopeful that China, in the interior, will improve very much in the near future. Her government is trying to change, "but a long number of years that no one can calculate must pass before the hundreds of millions of Chinese peasants shall awake from the senseless lethargy of their daily life."

The Count is happy in his description of the rugged scenery through which his journey led him. He is a good traveller, meeting difficulties in a masterly manner. To the resources of the regions through which he passed his eyes were open—to its agricultural interests, primitive as they are; to its mines, which are rich, but at present most difficult of access.

The illustrations are of a high grade and have been well selected. A good map shows the course taken. E. L. S.

A Physical, Historical, Political and Descriptive Geography. By Keith Johnston, F.R.G.S. With Maps and Illustrations. Sixth Edition, Revised by A. H. Keane, LL.D., F.R.G.S. London, Edward Stanford, 1908.

This sixth edition of Johnston's Geography, issued under the general title "The London Geographical Series," is practically identical with the fifth edition. Its geographical records are brought to date. What with the liberal use of fine type, not always easy to read, with the tables and excellent map illustrations, there is crowded into four hundred and ninety-one pages considerable geographical information.

A particular pleasure always accompanies the reading of a well-printed book, and the name Stanford is almost a synonym for good geographical printing. The section of about eighty pages treating the subject of historical geography is not the least striking feature of the work. The twelve maps inserted in this part of the work illustrate in a novel and interesting manner the expansion of geographical knowledge from earliest times to the present. Fifty-five pages are given over to the consideration of the general problems of physical geography, and the remaining portion of the work to the descriptive geography of the various continents and their several political divisions. A work of this character will always be useful to students. E. L. S.

Physical Geography of the Evanston-Waukegan Region. By Wallace W. Atwood and James Walter Goldthwait. 102 pp. Numerous Photographs, Black and other Colored Maps, Diagrams, Bibliography and Index. Bulletin No. 7, Illinois State Geological Survey, Urbana, Ill., 1908.

This is the latest of the octavo bulletins which the Illinois State Geological Survey is issuing. The region is studied in its geographical, geological, physiographic and cultural relations. It is an area of exceptional and varied interest from the point of view of physical geography. The action of the continental ice sheet which once covered the region is clearly described, the fascinating history of Lake Michigan is related, the analyses of the development of the stream courses have especial interest and the discussion of water resources is of practical importance to all residents of this thickly populated region.

Dr. H. Foster Bain, Director of the Survey, says that these bulletins are especially intended to put useful information, concerning the geography and geology of the State, before those who are not special students of these sciences. It is gratifying to see that the State Surveys both of Illinois and Wisconsin are keeping this laudable purpose in view. Dr. Bain adds that in preparing these bulletins two classes of persons are kept especially in mind: intelligent citizens who know little or nothing of geology and teachers of physical geography and geology. The bulletins, placed in the schools, will give teachers and students a general account of the principal geographical and geological features of their regions, and it will be useful as a field book.